APRIL 1995

Macworld

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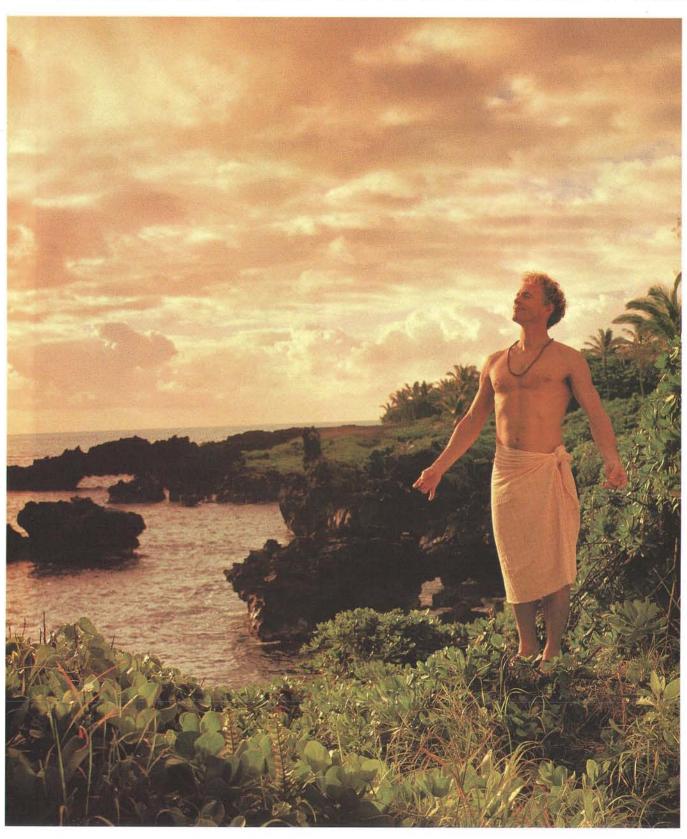
First Lab Tests

Clones

Extensive Analysis
Reveals Speed
and Mac Compatibility

Plus: 13 More
Players Likely to Take the
Mac Clone Plunge,
Page 92

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FECT HARMONY IN THEIR LIVES.
ECT HARMONY IN YOUR MAC?

Microsoft Office 4.2

Everything in your life may not always come together. But on your Macintosh, it's another story. Because now there's a family of leading, full-featured programs for the Mac that truly work together like one.

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One click turns your Word document into a PowerPoint presentation.

ENCORE UPDATE
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built-in intelligence that senses what you want to do, then helps you do it.

Behind Office, you'll find even more smarts: Microsoft's unlimited product support. It's available at no service charge.* Just call.
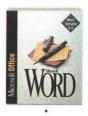
But first, call (800) 709-3787, Department YP4, to locate a retailer near you. They'll help you learn all about Microsoft Office Standard 4.2, in versions for both Macintosh and Power Macintosh™.
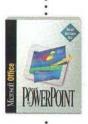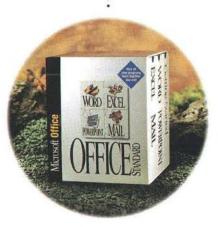
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Microsoft Office 4.2 for Macintosh and Power Macintosh includes new versions of Microsoft Excel, Word, PowerPoint® and a Mail workstation license.

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EXCEL

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OFFICE STANDARD

Microsoft **Office**

OUR NEW PRINTER MAKES
AND THOROUGHLY CONV
(MUCH LIKE THE ONE WE'

At this very moment, it's our job to dazzle you, persuade you, and sell you on this great idea we have. Of course, you already have that job, every day. And that's exactly why you should consider the new NEC SuperScript™ Color 3000 printer for Windows™ and the SuperScript Color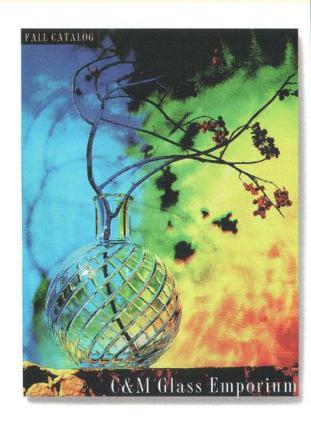 3000M for Macintosh®. If you make overheads, if you make slides, if you make graphic presentations, they simply make your work look clear, precise, and professional.

Thermal Transfer Process

You see, the SuperScript Color 3000 is a thermal transfer printer. And, when it comes to color, it is far superior to an ink-jet printer. Ink-jet printers can leave you with washed-out colors. Not so with thermal transfer.

What's more, this NEC printer allows you to choose between three different modes of printing. That's because, as you know, color printing can get expensive, and there are times when you need a color print but not a deluxe photographic-quality print. The SuperScript Color 3000, unlike most printers out there, gives you a choice.
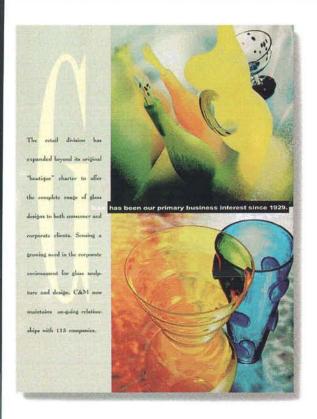
Photo Color™ mode gives you the ability

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PHOTO COLOR MODE

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Photo by Paul Franz-Moore

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Buyers' Tools

Reviews

Get a whole new perspective.

This image from NBC's new television series *Earth 2* was created with Infini-D, Specular's professional 3D modeling, rendering, and animation tool. Infini-D's ease-of-use puts the power of 3D illustration and animation into the hands of any designer. The models in this scene were instantly created from EPS outlines drawn in Adobe Illustrator™. A combination of image maps and bump maps were applied to the objects to enhance their realism. Since Infini-D is native for the Power Macintosh, rendering a high-quality animation was quick and easy. No matter which planet you're on, you will find that "Infini-D offers sophisticated controls and features that make it easy to create 3D scenes and animations... at a price that makes it difficult to resist." MacWEEK

Specular Infini-D 2.6

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Add some texture to your life.

Each texture in this image was created with TextureScape, Specular's versatile texture-generation program that lets you design unique, high-resolution textures. TextureScape's extensive design features allow you to control virtually every attribute of a texture or pattern. Experiment with shape, color, light, spacing, layering, motion, and more! TextureScape files take up less than 40K of disk space, but since they are based on PostScript shapes from programs like Adobe Illustrator™, you can render them to any size you need. Your textures are even tileable! TextureScape can also produce QuickTime movies of morphing textures for multimedia presentations or video. With the power to design anything from patterns like fabrics and tiles to organic textures like wood and marble, "...it's hard to beat TextureScape for an endless supply of cool textures." MacUser

Specular TextureScape 1.5

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Circle 41 on reader service card

Even the Editors Agree. In High-Performance Graphics Accelerators, The Choice Is EAsy.

"The EAsycolor 24 duplicates the functions of the Radius Thunder IV cards, but at a lower price."

-MacUser February, 1995

While it's great to get good press, this quote only begins to tell the whole story. True, the new EAsycolor 24™ family of 24-bit high-performance graphics accelerator cards starts at $1,299, far less than the Radius Thunder IV series (starting at $2,599). And, they both feature Adobe Photoshop™ filters and CMYK-to-RGB image acceleration in a 7" NuBus board design. But from there, EAsycolor 24's functionality goes much further.

First, EAsycolor 24 cards feature the power and speed of a programmable RISC processor. Radius still uses an ASIC design, which is yesterday's technology. RISC is state-of-the-art and gives you far more flexibility and performance.

Second, EAsycolor 24 cards offer faster QuickDraw™ acceleration. They also have more on-board VRAM than the Thunder line, and are much easier to upgrade for today's powerful new graphics software. So, you have all the color accuracy, resolution and power you need to work at the highest level of graphic design and production.

A family of cards are available so you can decide based on your needs and budget:

EAsycolor 24/1152 A great value, offering 24-bit acceleration at resolutions up to 1152x870.

EAsycolor 24/1360 For graphics and pre-press professionals who want power and performance for resolutions up to 1380x1040 at an attractive price.

EAsycolor 24/1600 Perfect for high-end users with demanding pre-press and document imaging applications at resolutions up to 1600x1200.

Call EA Research direct at 1-800-681-6566 to order. Or call your favorite Mac reseller, including MacMall, DTP Direct, and MacZone.

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Circle 231 on reader service card

Cloning Opportunities

How clones can succeed by satisfying customers

ONLY A FEW MONTHS AFTER Apple publicly committed to licensing the Macintosh Operating System, the floodgates are open and the first Mac clones are rushing into view. Last issue, *Macworld* reported that both Radius and Power Computing Corporation announced their intention to produce the first Mac clones (see *News*, March 1995). Apple is pinning its hopes on licensing to increase the Mac's market share in the face of the onslaught of Wintel (Windows/Intel) machines. But there are many challenges facing Apple and clone makers along the way to producing a broader and more successful Mac market.

As the sole systems vendor in its own market, Apple's life was difficult enough. Now, Apple has a much bigger and trickier task in supporting clone makers while competing with them. Clone makers, to build their businesses, will have to identify the opportunities outside the current Mac market and approach them effectively. And we as customers are likely to face many new choices while clone makers explore these alternatives. On the whole, these choices should be good for the Mac community, but there will likely be some pitfalls along the way that both users and Mac-clone makers need to avoid.
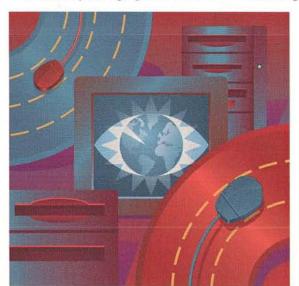
Why do clone makers think they can succeed in a market Apple dominates? Historical precedent: IBM clones. But clone makers must compete against Apple's powerful brands, its entrenched position, and formidable customer loyalty.

There are several questions clone makers will have to answer correctly to create a successful business strategy. Should clone makers attempt to undercut Apple by offering low-cost computers, or should they adopt a value-added approach by selling high-performance computer models with lots of features? Do they go after education sales, or should they concentrate on corporations? Should they sell their products by phone and mail or through retail stores? Finally, what kind of identities can they build to distinguish their companies and products?

More for Less

Apple offers an amazing array of sophisticated products, so at first it's hard to think of what else a clone maker could offer. But imagine getting more for less. Clones could provide better standard equipment, such as higher-capacity hard drives or more memory. If two systems have similar performance, features, and prices, but one includes a 230MB hard disk, 8MB of RAM, and Apple's known quality, and the other is a clone that includes a 1GB hard disk and 16MB of RAM, which one would you choose? Other improvements might include built-in Ethernet transceivers or quadruple-speed CD-ROM drives, instead of dual-speed CD-ROM drives.

Of course, providing more for less is hard. A few years ago potential clone

makers drooled at the thought of competing against Apple, which had huge profit margins relative to the margins in the PC market. Recently Apple has closed that margin gap. (There are a couple of exceptions: the high-end Power Mac 8100 remains relatively expensive, as do the higher-end PowerBooks.) Wintel clone vendors survived because of their lower overhead compared with IBM's, especially in R&D. Many reduce overhead by selling direct, so they can offer better standard equipment.

In addition to providing better standard equipment, Macintosh clones could also build in new hardware options. Why not include an affordable tape-backup device for personal users? Maybe create a dual-CPU DOS-and-Mac system something like Apple's DOS Compatible, except integrated at the motherboard level, eliminating the two sets of I/O. Other options could include PCMCIA or Access.bus, drives that lock physically, and VGA ports.

Custom Clones

Clone makers also have a chance to offer customers more options for initial configuration. Apple sells complete, take-it-or-leave-it systems. Dealers hate this approach, and some will swap drives and RAM among systems to make a customer happy. But dealers would much rather get an unencumbered machine and a bunch of components and assemble what their customers want.

Over time, customers also want to upgrade their computers. But they don't want to throw out perfectly good components, peripherals, and cards just because they are upgrading a motherboard or some other piece of their system. It's a compelling issue for people who must spend thousands of dollars, and it explains why Mac owners keep their IIci's long after a PC owner would have upgraded the motherboard. Clone makers could build an entire strategy on providing sensible upgrade paths that let users preserve their hardware investments.

Clone makers could offer computers with both PCI and NuBus expansion slots, saving customers from throwing out any NuBus cards they already have as they upgrade, or simply letting them choose the best card for a task regardless of what bus it's for. Supporting multiple buses is common in the PC universe.

continues

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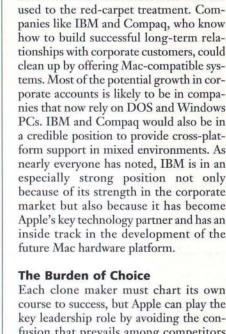
First Clones Arrive

With all this in mind, let's examine the real-world examples. Radius, for one, appears to be taking aim at limited but lucrative markets as a value-added reseller (VAR). Radius clones are intended for customers who need to apply a lot of system power to their tasks in color prepress, imaging, and video production (see the feature "First Clones" in this issue for more details). Radius has already built a strong customer base in these areas.

Radius can offer systems tailor-made for production environments, which often require everything from disk arrays to special-purpose video cards.

If Radius is at one end of the spectrum, Power Computing is at the other. Power Computing's strategy is exactly the "more for less" described earlier. Instead of selling through traditional retail outlets, Power Computing plans to focus on direct sales, while trying to build a reputation for solid engineering and good

value. This makes sense because Apple has forgone direct sales at a discount.
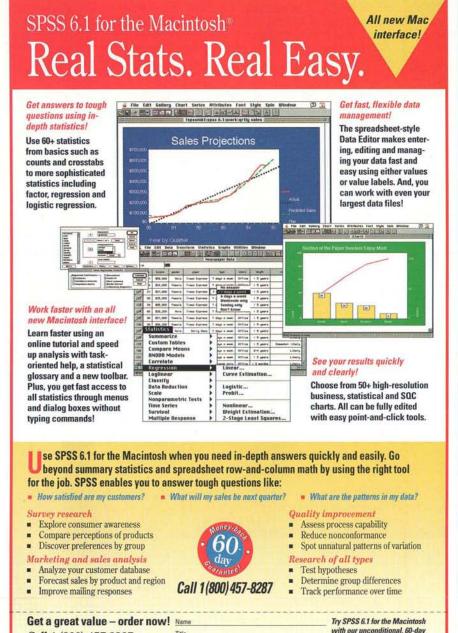
Perhaps the biggest plum left on the tree is the corporate market. These customers spend more on installing and maintaining computers than any other group. Apple's lack of success in this market is well known. It has failed to build enough good relationships with purchasers in large companies. The word on that street is that Apple sales reps frequently told corporate buyers what they needed instead of listening first. This doesn't sit well with customers who are used to the red-carpet treatment. Companies like IBM and Compaq, who know how to build successful long-term relationships with corporate customers, could clean up by offering Mac-compatible systems. Most of the potential growth in corporate accounts is likely to be in companies that now rely on DOS and Windows PCs. IBM and Compaq would also be in a credible position to provide cross-platform support in mixed environments. As nearly everyone has noted, IBM is in an especially strong position not only because of its strength in the corporate market but also because it has become Apple's key technology partner and has an inside track in the development of the future Mac hardware platform.

The Burden of Choice

Each clone maker must chart its own course to success, but Apple can play the key leadership role by avoiding the confusion that prevails among competitors in the PC marketplace. Next month I'll explain what a tremendous challenge this is and how Apple can rise to the occasion.

Clones will create an array of new choices that will add needed strength to the Mac universe but also create confusion. Customers will have to juggle many new choices while staying alert to differences in product quality, features, and customer support.

Macworld's commitment is to provide you with the most in-depth information and product guidance to help with difficult purchasing decisions. In this issue, Macworld Lab carries out the first extensive performance and compatibility tests of Macintosh clones to help you determine how viable these alternatives to Apple-branded Macs really are. We'll also help you understand what lies down the road. That's why we've included a companion story describing future clones likely to result when Apple and IBM finish building their shared hardware platform (see "Mac Hybrids"). We've been clamoring for clones for years—now that they're arriving, they present new opportunities and new challenges. ▥

Introducing Macintosh System 7.5. It can

Drag-and-Drop printing.

Avoid lines when working on your network. You can print documents simply by using icons on your desktop. To print a file, just drag it onto a printer icon. To change printers, just drop the file onto a different printer icon.

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It's built in, so now you can easily share documents with DOS and Windows users, view the contents of DOS disks as if they came from another Mac, and open and edit files even when you don't have the applications they were created in.

Enhanced desktop.

Faster and easier access to items in your Apple menu. Track and retrieve your most recently used applications, documents and servers more quickly. Create convenient, on-screen notes with new electronic Stickies.

EMPLOYEE EVALUATION

NAME: Chris Wolfe   **DATE PREPARED:** 9-8-94

TITLE: Product Manager

DEPARTMENT: Account Management

OVERALL PERFORMANCE:

☒Outstanding ☐Commendable ☐Satisfactory ☐Needs Improvement

COMMENTS:

Chris has become an indispensable member of the account team. He has demonstrated a high level of motivation and enthusiasm for the job. Perhaps the most compelling evidence of this can be found in his ability to work independently, where he picks up new tasks easily with little need for supervision or instruction. He consistently recognizes and works around obstacles to maintain productivity. Consequently, he often completes assignments ahead of schedule. At a time when collaboration is more critical than ever, Chris has also proven to be an excellent team player. He works effectively with coworkers on projects where teamwork is essential, and can easily motivate and inspire others to achieve. When delegating tasks, his thoughts are well organized and his ideas clearly articulated – an indication of his excellent communication skills. His projects are all distinguished by an attention to detail. His conclusions are always sound and logical. And he excels in time management, effectively compiling and analyzing information. He always manages to work efficiently, setting an example for effort throughout the company. Promotion and appropriate compensation are recommended at this time.

Chris Wolfe
Employee's Signature

JBloom
Evaluator's Signature

upgrade your career.

Apple Guide.
Learn by doing. Apple Guide can teach you how to use your Macintosh and new applications by walking you through tasks and procedures step by step. On-screen instructions literally point to and highlight the step being described.

Universal Mailbox.
Keep track of how to communicate with people. This single mailbox automatically combines and sorts all your incoming and outgoing mail—including on-line services, e-mail, voice mail, faxes and other messages.

AppleScript.™
You know those tasks you repeat over and over? With AppleScript, you can automate a series of actions you perform frequently and repeat them with a single keystroke. Leaving more room for work—and less room for error.

Today, everybody keeps telling you to work smarter, not harder. Wouldn't it be nice if someone finally told you how? Introducing Macintosh® System 7.5. The latest version of the Macintosh operating system. A series of more than 50 refinements that will do more than simply change the way your Macintosh works—they'll change the way you work. Making you more productive than ever.

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See your Apple dealer now.

For starters, Macintosh System 7.5 enables you to collaborate with others much more effectively.
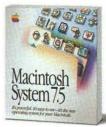
It speeds up repetitive tasks, makes it possible to send and receive mail from a variety of sources through a single mailbox, lets you swap files with PCs and allows you to open Macintosh, DOS and Windows™ documents—even when you don't have the applications used to create them.

When it's time to print, you can do so quickly by using simple icons right on your desktop.

You can even teach yourself how to use your Mac™and new applications with the Apple® Guide, as it literally walks you through procedures, step by step.

Ultimately, it's all about giving you more of everything you buy a Macintosh for in the first place. More power. More performance. More simplicity. More Macintosh.

For the name and location of an authorized Apple software reseller near you, call 800-538-9696, ext. 250.

Because with the new power of Macintosh, there's really no telling how far you'll be able to go.

The power to be your best.™

Apple

Letters

Microsoft Takes It on the Chin

AS A FAITHFUL USER SINCE VERSION 1, I must strongly disagree with your review of Microsoft Works 4.0 in the January 1995 issue.

I have been using 4.0 for some time now on a Macintosh LC III with 16MB of RAM and two 256MB hard drives, and I sorely wish I could easily downgrade my files back to version 3, as I have encountered serious problems.

Saving files is slow, and when I say slow I don't mean a simple delay, I mean go-get-a-cup-of-coffee slow. A 190K database document can easily take up to 60 seconds to save, sometimes longer, and just saving a one-word change to a 4K letter can run 20 seconds or more.

You must view all documents in page view and thus lose a lot of screen real estate to white space (margins, header, and so forth). Carefully resizing the window and centering the document becomes tiresome quickly. Upon calling Microsoft, I was informed that permanent page view was a new feature and not a problem. Obviously all developers must have 21-inch-plus screens, much larger than my measly 13-inch display.

If the Works 3.0 file I want to open is too large (and there is no real indicator of what constitutes "too large"), the program crashes, losing everything in progress at the time. Hardly an elegant failure mode. The only fix is to give Works 4 a lot of memory to play in.

Andrew Bennett
Cambridge, Massachusetts

YOUR REVIEW OF MICROSOFT WORKS 4.0 left my mouth agape. Could you have tested the same program that has randomly locked up each of the four computers on which I currently have it installed (Classic II, LC 550, LC 575)?

Did you try opening a file created in an earlier version in Works 4.0? A set of lecture notes that we saved as a 3-page document in 3.0 might open as a 26-page document in 4.0.

What is Microsoft doing about all this? I will say that the tech-support people are courteous. Of course, you must foot the bill to call them, a call that may have you on hold for 25 to 30 minutes. They will tell you to turn on virtual memory and make a larger RAM cache. This only makes the program slower than it already is, and believe me, it *is* slow.

They say help is on the way. A patch of some sort will ship to those who have called, complained, and gotten their name on a list. But Microsoft admits that this patch will not address all the problems.

How you could possibly have come up with three stars for this product is completely mystifying.

Alfred R. de Jaager
via the Internet

It's true that you are restricted to page view in Works 4.0, but we didn't consider this a problem, upholding as it does the WYSIWYG standard that the Macintosh helped pioneer. Incidentally, ClarisWorks also displays documents in page view only. We never encountered the slow saving problem detailed by Mr. Bennett. Microsoft acknowledges that there are problems with Works 4.0 opening version 3.0 documents that contain bullets or custom page breaks; the problems stem from Works 4.0's new text-editing engine. A free patch is available that irons out those bugs—the patch updates the program to version 4.0b. Readers can call Microsoft customer service at 800/426-9400, or product support at 206/936-7160.—Ed.

MY JAW DROPPED SEVERAL TIMES while I was reading your review of Microsoft Excel 5.0 in the January 1995 issue—most notably when you mentioned that it took "24MB of RAM" to run comfortably. Wow! It would take the RAM from four of the Macs in our office to achieve that mind-numbing total. If this were your April issue, I'd be sure this was a check of my credulity.

Microsoft has missed the boat on this product, as well as Word 6.0. There are lots of Macintosh users who are like hell going to invest in the kind of RAM necessary to run these new programs.

As for me, my new motto: "Upgrade? What upgrade?"

Frank Shaw
Portland, Oregon

I JUST RECEIVED MY LATEST ISSUE OF *Macworld*, with the words "The Macintosh Authority" emblazoned on the cover. After reading your review of Microsoft Excel 5.0, I wonder how on earth you could possibly give this sluggish, overrated, unwieldy piece of software hubris four stars? The review makes clear that Excel 5 takes Microsoft's talent for overcomplexity, bad user interfaces, and gross obesity to new heights.

Case in point: your tests showed that Excel 5.0 performs recalculations twice as slowly on the 6100/60 as on a 66MHz Pentium. I have seen published tests using Painter, Photoshop, Mathematica, and SPECmarks, and in each case the Power Macintosh 6100/60 has trounced the 66MHz Pentium's FPU performance. Either Microsoft is grossly incompetent, *continues*

LETTERS

CORRECTIONS

■ *The correct phone number for Mosaic Communications in "Mosaic Goes Commercial" (News, January 1995) is 415/254-1900. Also, the company has since changed its name to Netscape Communications.*

■ *Polacolor Pro 100, a new instant color film designed for professional photographers, is made by Polaroid, not Kodak ("Easy Color Separations," Graphics news, January 1995).*

or it doesn't really care about making Excel "accelerated for Power Macintosh." Attention, other software companies: here's your chance to pop this overblown balloon of a spreadsheet.

*Mic Chaudoir
via the Internet*

Featherweight Champ

FINALLY! WENDY SHARP RECOGNIZES that the Duo makes a great first or second computer ("What's the Best Portable?," January 1995). I've been telling people that for a year—the Duo is a well-designed, light, small, we-don't-need-no-stinkin'-mess-o'-cables machine with better batteries than the all-in-one PowerBooks. Thanks for daring to take an unpopular stand, Wendy—the facts bear you out on this one.

*Paul Collins
San Mateo, California*

I ENJOYED THE ARTICLE ABOUT THE Duo 280c versus the PowerBook 540c in January's *Macworld*, and it summarizes the dilemma facing buyers of these two systems. I ended up with a Duo and am happy with its portability compared with a 100-series PowerBook, even though the lack of an immediate floppy or SCSI output can be a pain when you suddenly realize that an extension is missing or a file needs to be updated.

I do have one big grouse, though. It has been *impossible* to get a Type III intelligent battery of late (and I have tried many sources), or a recharger that works for these batteries. Perhaps Apple can redesign the next generation of Power-Books to use generic peripherals that the much larger PC base uses.

*Michael Chee
via the Internet*

I HAVE BEEN USING A POWERBOOK 165 for a year now, and the main reason I chose it over a Duo was its built-in flop-

py drive. Now that I have it, I am eternally grateful for the ADB port. I regularly use a numeric keypad and would hate to live without it.

How tiring can it be to carry around 10 pounds instead of 7? I'll gladly lug 3 whole extra pounds to have everything in one package rather than realize I've left part of my docking station at home. Besides, having worked with MIDI for several years, I've learned that the more components you have to plug in, the more chances there are for something to break down.

*Dan Meredith
Warfordsburg, Pennsylvania*

Emissions Politics

RATHER THAN ENCOURAGE GOVERNment spending on magnetic-field research, I encourage you to include an address for contributions for the Center for VDT and Health Research, at Johns Hopkins (*Conspicuous Consumer*, December 1994). Every dollar comes out of my pocket eventually. I would rather have 100 percent of my money go to actual research than pay for the overhead of government bureaucracy.

*Thane Eichenauer
Tempe, Arizona*

Dr. Ronald Gray (410/955-7818; fax 410/955-0792) is director of the Center for VDT and Health Research at Johns Hopkins University. Phil Shellhouse of IBM serves as the administrator for the foundation. He can be reached at 202/515-5080.—Ed.

Expert Graphics Copywrong

I LOOK FORWARD TO EACH NEW ISSUE of *Macworld* to try (in vain) to keep up with what's goin' on in MacSpace. Without your magazine, I'd have to quit working just to make enough time to keep up with operating-system enhancements and new hardware architecture. Truth is, I would probably just wander around Myst all day until I was reduced to a drooling shell of my former self. Keep doin' what you're doin'.

But the *Expert Graphics* how-to with the image by Annabelle Breakey (January 1995) has me scratching my highly reflective scalp. Did I miss something? When did wrapping paper (and the images therein contained) fall into the public domain? Was it simply understood that Ms. Breakey owned the wrapping-paper company, or that she had express written permission to sample the paper for use in the manufacture of a product for resale? *continues*

Or did she just appropriate the image as so many overzealous (and budget- and deadline-conscious) graphics professionals do now as a matter of course?

As a photographer living and working in the wrapping-paper and greeting-card mecca of the western world (headquarters of Hallmark), I would be more than a bit hesitant to grab one of Hallmark's patterns for my own use. It just ain't worth it.

Bud Simpson
Kansas City, Missouri

Wrapping-paper designs—like any other artwork—are indeed protected by copyright. But in this case, Breakey scanned a section of the wrapping paper that was taken directly from a fifteenth-century map, which is copyright-free due to its age. The copyright for the wrapping paper applies to the overall design (which includes a border of flags added by the designer) but not the map itself, which, according to Breakey, was unaltered from its original form. Had Breakey scanned and used the entire sheet of wrapping paper in her image, she would indeed have violated that copyright. But since she used only the section that's in the public domain, she committed no copyright infringement.—Ed.

Hidden Agenda

AFTER TAKING A SECOND LOOK AT the review of Adobe Photoshop 3.0 (January 1995), I saw a familar but forgotten face on page 53—Vladimir Ilyich Lenin had been cropped, tiled, and pasted into the layout.

There could be several explanations for this: (1) Deke McClelland or someone on your staff is trying to subliminally influence my political leanings; (2) Deke admires communists and can't come to grips with the fact that they've melted down many statues of Lenin; or (3) you guys were just testing the perception of your audience.

Nice try, comrade.

Richard Tombelli
Director of the People's Department of
Design and Illustration
Automation Graphics and Design
East Lansing, Michigan

Letters should be sent to *Letters, Macworld*, 501 Second St., San Francisco, CA 94107; via fax, 415/442-0766; or electronically to CompuServe (70370,702), MCI Mail (294-8078), America Online (Macworld), eWorld (Macworld), AppleLink (Macworld1), or via the Internet (letters@macworld.com). Include return address and daytime phone number. Due to the high volume of mail received, we can't respond personally to each letter. We reserve the right to edit all letters. All published letters become the property of *Macworld*. ∎

SEE RED.

Design: Wheeler Design
Photography: Kory Addis

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MacBulletin

◀ Apple Reveals 3-D Architecture To make 3-D modeling and rendering as mainstream and accessible as 2-D illustration, Apple has introduced QuickDraw 3D. QuickDraw 3D's interactive renderer will allow you to easily produce and manipulate 3-D imagery in real time. You will then be able to drag the image into a 2-D environment such as a page-layout or illustration program—where the image will be completely editable but will not lose its 3-D information. An extensible architecture for Power Macs (but not 680X0 systems), QuickDraw 3D should appear this summer, with a Windows version due six months later.

◀ Power Mac 8100s in Short Supply Macintosh dealers contacted by *Macworld* reported difficulty getting Power Mac 8100/100 and 8100/110 systems from Apple. ComputerWare, a chain in the San Francisco Bay Area, reported 225 back orders for 8100s. Apple said in early February that the 8100/100 was "inventory constrained" due to high demand, but predicted the situation would ease in a few weeks.

◀ PowerBook Delays Users can expect PowerPC PowerBooks "in the summer time-frame," according to Brodie Keast, vice president of Apple's PowerBook division. This is a shift from Apple's previously stated "first half of 1995." The PowerPC 603, the chip originally slated for the PowerBooks, was unsatisfactory in a laptop design, so Apple decided to wait for a chip unofficially dubbed the 603+ (see "PowerBooks May Face Delay," *Power Mac News, Macworld,* September 1994). The 603+ recently surfaced as the PowerPC 603E (see following item).

◀ Improved PowerPC 603 Unveiled Reacting in part to 680X0-emulation performance problems reported by Apple, IBM and Motorola have announced first silicon of the PowerPC 603E, a modified version of the PowerPC 603. The 603E runs at 100MHz and has memory caches twice the size of those on the PowerPC 603. The companies improved the chip's performance and its variety of bus speeds. Apple says that it will use the 603E in its first PowerPC PowerBooks. IBM and Motorola have also announced first silicon of the PowerPC 602, designed for portables and PDAs. Both chips should ship in the second half of 1995.

◀ Low-Cost 603-Based Desktops Although the PowerPC 603 didn't work out for Power-Books, Apple will use the chip to create desktop systems that may offer the performance of a basic Power Mac 6100/60 (without cache RAM) at a much lower price, according to Carlos Montalvo, Apple product-line manager. Apple recently demonstrated a prototype of a 630-style Power Mac based on a 603 chip running at 75MHz. A desktop Mac can easily support external cache RAM, which the 603 requires for good performance but which consumed too much power and space in an earlier attempt at a 603-based PowerBook.

OpenDoc Delay Apple said in early February that the final version of OpenDoc for the Mac probably would not ship until fall, about five or six months after the original target of March or April. Open-Doc will be released as an extension to System 7.5 and will eventually be included as part of the Mac Operating System. Novell and IBM are simultaneously developing OpenDoc for Windows and OS/2, respectively.

◀ Clone Agreement Power Computing said that CompuAdd Computer Corporation, a maker of PC systems in Austin, Texas, will build some of Power Computing's Power Mac clones (see "First Clones," in this issue). CompuAdd expects to ship the first Power Computing clones by April. Power Computing also announced a toll-free number: 800/999-7279. **m**

News

Copland: Rebuilding the Mac OS

Apple's next major revision to the Macintosh Operating System—codenamed Copland—will be a major reworking of the 11-year-old OS that should require fewer system resources, crash less often, remove hardware dependencies (to speed development of the Apple-IBM converged PC standard), and give Mac programs a taste of true preemptive multitasking. Preemptive multitasking shields programs and OS components from each other and lets them reliably execute at the same time without interfering with each other. Apple's Copland engineering team recently discussed the Copland strategy with *Macworld* and detailed these and other salient features of the next Mac OS.

Most significant in the Copland effort appears to be Apple's commitment to make the Mac OS more efficient. By rewriting the core OS, called the kernel, Apple hopes to remove the inefficiencies introduced by years of squeezing new functions into the original OS. These inefficiencies explain why the Power Mac 8100/110 performs more slowly than a

90MHz Pentium PC in many cases, Apple engineers say (see "Power Mac vs. Pentium PC," *Power Mac News*, February 1995). A leaner, more efficient OS should let the Mac do more with the standard amount of RAM or require less RAM for users who run just one program at a time. It will also let software developers and designers of add-on peripherals get better performance, since their products will not bog down under the Mac's current inefficiencies.

As part of that reworking of what Apple engineers call the OS's plumbing, Apple will introduce a hardware abstraction layer (HAL) to Copland, which will make it easier for Copland to work on Mac clones that use different controllers and other low-level hardware than Apple's Macs

use. A HAL acts as an interpreter between the OS and a computer's components, limiting developers' abilities to tie a function directly into a specific component. Use of low-level dependencies may let a developer implement a particular function more easily now, but they also make it more likely a product will not work correctly if that component is changed, either as the Mac

evolves or as Mac-clone makers use alternative components that don't act as the dependent product expects. Implementing the HAL is one reason Copland has been delayed until mid-1996, from the original target of late 1995.

Having a HAL and a rebuilt OS will also help Apple revise the Mac OS more quickly, helping it in the face of ongoing competition from Windows and OS/2. Apple is taking a multistage approach to revising the OS: one example is Copland's partial use of preemptive multitasking and protected memory. With a complete combination of techniques, the OS gives every program its own memory-address space and allocates mutual resources to prevent conflicts that might cause programs to fail (such as when faxing in the background while doing a database sort). In Copland's partial implementation of preemptive multitasking, the Mac OS will work in one protected space, and all programs will share another space. But programs can generate subprograms that run in their own protected spaces.

Having this limited form of preemptive multitasking will give Mac developers time to learn about how to use the technique for critical needs while Apple has the time to extend the technique so each program has its own space. When the successor to Copland, code-named Gershwin, ships in 1997 or 1998, it will support full preemptive multitasking. Apple expects that developers will have revised their programs during the Copland period, so as soon as Gershwin is released developers can take advantage of its full preemptive multitasking. This strategy is similar to the one Microsoft has pursued in its shift to preemptive multitasking between Windows 3.1 and Windows 95: Microsoft used the intermediate Windows for Workgroups and Windows NT to offer partial preemptive multitasking support, giving both developers

and Microsoft time to convert their programs and OS.

Another major change is writing most of the Mac OS as native Power Mac code. Today, less than half of the Mac OS is native, which causes slowdowns for many critical operations, particularly those involving input/output (I/O)—for example, disk writes, networking, and printing (see "Long Road to a Native OS," *Power Mac News*, in this issue). In fact, the entire I/O subsystem will be replaced, Apple says, to make it more efficient, more capable, and more stable. Apple expects 95 percent of Copland to be native code, although some Apple engineers say that is an optimistic estimate.

Apple also expects to open up its application programming interfaces (APIs) to make it easier for developers to take full advantage of the Mac's capabilities. Many developers now spend a great deal of engineering effort developing their own versions of features that the Mac already has but that developers can't access as they need to. Apple hopes this open API approach, coupled with further work on the Quick-Draw GX imaging/printing module and the PowerTalk communications module, will convince developers to take advantage of these Apple technologies.

In its Copland revision, Apple also expects to change the user interface by making it more customizable. Although the interface work is still in the conceptualization stage, the company expects to rely more on Apple Guide technology to automate tasks and lead users through choices.

Before Copland is released, Apple expects to deliver less ambitious updates to System 7. The first such update will be Marconi, which will be released with the first PCI-based Power Macs in June or July.—GALEN GRUMAN

HANK OSUNA

Apple Licenses Game Player

BANDAI TO SELL PIPPIN CD-ROM PLATFORM

No, this isn't a misprint or an April Fools' story. Apple has announced that it has completed and will be licensing Pippin, a CD-ROM game platform similar to 3DO and Phillips' CD-I. According to Apple, Pippin is based on the Mac OS and uses a PowerPC 603 chip and a 4× CD-ROM drive; Pippin titles will run without modification on Macintosh systems, and Mac CD-ROM titles will require only minor tweaks to run on Pippin systems. The company also said that users would be able to play MPEG-compressed movies with a third-party expansion card to be announced.

In some ways this announcement seems like a good-news, bad-news sketch. The good news is that Pippin opens another avenue to push PowerPC and the Mac OS (however mutated) in front of consumers. The bad news is that the bloody, vicious console game arena is characterized by paper-thin profit margins and a fickle audience. The good news is that the industry is in transition to a more powerful class of machine, creating opportunities for new companies to grab market share. The bad news is that many end-users may wait for a clear winner to emerge before they buy into a new platform.

The first Pippin licensee is Bandai, the Japanese toy *continues*

1.5 Million HP Ink-Jets Need Fixing
Hewlett-Packard recently began shipping a free kit to fix paper-handling problems in the DeskJet 550C, 560C, 520, and 510, and in the DeskWriter 520 and 510. Affected models have a serial number starting with the sequence US3 through the sequence US43. Users place the kit's cleaning pad in the paper tray, insert a provided disk, and run a program that causes the rubber paper-pickup roller to rub against the cleaning pad for 20 minutes. Once or twice should be sufficient for the life of the printer. Registered users should receive the kit without requesting it; users who have not registered should call 800/656-2324.

Digital Video System
Radius has introduced its Radius Edit 1.0 nonlinear video-editing software for professional TV, multimedia, and video producers. Radius Edit will be bundled with the company's $15,845 VideoVision Telecast video-editing system, which includes a video-editing card and video-out breakout box. The software supports dual monitors (one Mac monitor, one NTSC preview monitor), QuickTime 2.0, built-in titling (including support for QuickDraw GX font effects), high-speed previews, built-in transitions, multiple key frames, and the ability to save effects as styles that can be reused in other projects. 408/955-1556.

Converging Communications
CommuniGate is a $299 software platform that supports modules for applications such as fax, voice mail, paging, E-mail, file transfer, and fax-back. Due in March, it includes a server application, a front-end application, fax module, and fax print driver. Through June, Stalker is offering CommuniGate with fax for $29 and the original disks from any fax program for the Mac. A voice-mail module costs $99. 415/927-1026.

giant behind the Mighty Morphin Power Rangers. Bandai has said that its resulting Power Play machine will hit the stores at around $500 in time for the 1995 holiday season. Apple Computer, 408/996-1010.—CAMERON CROTTY

Digital Video Progress

TARGA 2000 AND MEDIA 100

Truevision and Data Translation, two giants in the video arena, are introducing new versions of their digital-video products that will give users improved quality. Truevision, a division of RasterOps, just announced that the Targa 2000, a high-end video-capture card popular in the PC market, will be released in a Macintosh version with the exact same name. The stats on the Targa 2000 for the Mac are impressive: the card offers full-screen, full-motion video recording from NTSC and PAL composite or S-Video sources (with full CCIR-601 compatibility), including fully synced 16-bit stereo audio. Output can be genlocked to an external source, and the board ships with a 20MB RAM buffer. An AT&T 3210 DSP (the same chip as in the 840AV) handles the audio, and the JPEG compression is via a daughtercard that could be swapped for other compression cards in the future.

The Targa 2000 should ship in March at a suggested retail price of $5599. In April, the company plans to offer a bundle of the Targa 2000 with a component option for Betacam SP and other high-end video formats. That bundle should cost an estimated $7999. Truevision said it is working on a PCI-bus version of the Targa 2000 that will work with the next generation of Power Macs.

Also, Data Translation announced version 2.0 of its Media 100 nonlinear digital-video system. The new version, now Power Mac–native and therefore faster, will sell for $8995, a 25 percent drop in price from the previous version. New features include All-In-One Mastering, a system that uses low-res proxies while editing and then automatically redigitizes high-res versions for final output; support for QuickTime 2.0; field-interpolated motion effects; genlocked output; and better output quality. The new Media 100 should be shipping by the time you read this. RasterOps/Truevision, 408/562-4200; Data Translation, 508/481-3700.—MATTHEW LEEDS WITH JIM FEELEY

Modems on a Card

PCMCIA COMES TO POWERBOOKS

Like Alice eating those magical morphin' mushrooms in Wonderland, PowerBook modems have grown . . . and shrunk; Angia Communications, Motorola, Practical Peripherals, and TDK are among the latest manufacturers to announce PCMCIA fax modems that

work with the PowerBook 500 PCMCIA adapter.

All these modems have the standard 14.4-Kbps data/fax feature-set down cold: V.32 speed protocol, V.32bis compression, V.42 error correction, V.17 fax protocol, and Group III fax support. Practical Peripherals is selling just such a basic model—its MacClass MC144T2 retails for $229. Angia sweetens the pot with V.34 (28.8-Kbps) support built into its latest SafeJack model. The SafeJack ($479) also comes with an adapter with two RJ-11 jacks so you can use the same phone line for voice and data, without plugging and unplugging.

Adding cellular capability is a popular approach; just add the appropriate cable and a data-capable cellular phone, and you're ready to be a roaming data warrior. Motorola's Power model (14.4-Kbps data/fax, $339) is cellular-ready, as is TDK's DF2814APB model. You have to pay TDK $79 for the cable to connect the card and the phone, while Motorola's cable comes free; on the other hand, the TDK fax modem can connect to several brands

PCMCIA-compatible fax modems from Practical Peripherals (left), Motorola (right), and Angia (bottom).

of cell phone, while Motorola's is limited to Motorola phones. TDK's offering also sports a high-speed V.34 data modem (14.4-Kbps fax, $499). Angia Communications said that it also has a cellular-capable model available.

Given reports of Apple's plans to build PCMCIA slots directly into future Power-Books, Macintosh users can expect to become more familiar with these credit card–size peripherals. Angia Communications, 801/371-0488; Motorola Transmission Products Division, 205/430-8000; Practical Peripherals, 805/497-4774; TDK, 916/478-8421.—CAMERON CROTTY

NuBus Woes Update

LATEST 8100 MODELS ADDRESS MOST CONCERNS

Responding to customer confusion over what, if any, performance problems owners of NuBus cards will experience with the latest Power Macs, Apple has released more details about the performance issues that may affect some card owners in the first set of 7100s and 8100s and in the current models. (See "Apple Won't Fix NuBus Flaws," *News*, March 1995.)

• Both new 8100 models—the 8100/100 and 8100/110—have new ROMs and a new NuBus controller chip, called the Bart 21. The new chip provides superslot ad-

THE AmCoEx INDEX OF USED MACINTOSH PRICES

Machine/RAM/Hard Drive	Average Sale Price	Monthly Change
PowerBook 100/4MB/20MB	$500	−$75
PowerBook 140/4MB/40MB	$700	−$50
PowerBook 180/4MB/80MB	$1550	−$50
PowerBook Duo 230/4MB/80MB	$800	−$25
Mac Classic/2MB/40MB	$325	+$25
Mac SE/30/2MB/40MB	$525	+$25
Mac LC II/4MB/40MB	$450	−$50
Mac IIsi/3MB/40MB	$450	−$50
Mac IIci/4MB/80MB	$650	−$25
Mac IIfx/4MB/80MB	$800	−$50
Centris 650/8MB/230MB	$1375	−$25
Quadra 900/8MB/160MB	$2000	−$100

Index provided by the American Computer Exchange of Atlanta (800/786-0717). It reflects sales during week of January 20. Configurations include keyboard and exclude monitor and display board for noncompact models.

dressing, which lets these Macs support more than the three built-in NuBus slots. To add NuBus slots, you need an Expanse NB external chassis from Second Wave (512/329-9283).

• In the Power Mac 7100/66, some users noticed slower NuBus performance than on a Quadra 840AV. The cause was the way the 7100/66's NuBus controller handles asynchronous master-burst reads from main system memory. Apple says that few cards read data this way, so most cards won't show a slowdown. In fact, the only card Apple is aware of with the problem is Radius's Video-Vision Studio, which uses master-burst reads for optimal performance (see "Video Hits Roadblocks," *Power Mac News*, September 1994). Other methods for reading and writing data had no flaws, the company says. Furthermore, Apple says that only the 7100/66 is affected—not the 7100/80, since its synchronous bus does not use asynchronous master-burst reads. Radius confirms that the VideoVision Studio 2.0 works well in the 7100/80. The 8100/100 and 8100/110 have asynchronous buses, but the Bart 21 chip makes them work correctly with the Video-Vision Studio, Apple says.

• An Apple product manager had indicated before the new 8100s shipped that because the 8100/100's 33.3MHz system bus speed (or the 8100/110's 36.7MHz speed) was not an even multiple of NuBus's 10MHz bus speed, some cards might have a slowdown relative to the 8100/80. However, Apple engineers have not seen any such slowdown and do not now believe any will occur.

• Many NuBus cards, particularly video-display cards, required new ROMs to work with the Power Macs. But major developers such as Radius, SuperMac Technology, and RasterOps have been offering those upgrades since last spring for many of their products.—GALEN GRUMAN

Driving Hard

NEW TECHNOLOGIES STOKE MARKET

Storage purchasers expect prices to drop while capacities and speeds skyrocket. To stay on the upward curve of speed and size, hard drive vendors are announcing products based on relatively new technologies like magnetoresistive (MR) heads, PRML (Partial Response Maximum Likelihood), and new SCSI protocols. These drives are OEM units and won't ship to the general public until mid- to late 1995.

Quantum has announced that it will lead off 1995 with two 3.5-inch drives with MR heads: the SCSI-2 Fast and Wide 1.1GB Capella VP31110 and 2.2GB VP32210. MR read heads pack bits more

The 3.5-inch Quantum Capella VP32210 stores 2.2GB by using MR heads to pack data closer together on the disk.

tightly together on the disk than do the less-expensive thin-film inductive heads currently in use. IBM has also announced new drives with MR heads, the SCSI-2 Fast and Wide 540MB (single-platter) and 1.08GB (dual-platter) Deskstar XP drives.

In addition to physically reading data that's more densely packed, the drive must be able to decipher it. PRML read channels help sort out the interference between adjacent data bits and allow for more efficient data storage. Nearly all hard drive vendors are touting the advantages of

PRML, but so far only IBM (several models) and Quantum (Empire 2100 and 1400) have introduced drives that use it.

While MR heads and PRML will increase storage capacities, companies are also working to improve data throughput by implementing one of the four parts of the ANSI SCSI-3 specification: Ultra SCSI, Fiber Channel Arbitrated Loop (FC-AL), Serial Storage Architecture, and P1394 (FireWire).

The least exotic of the four protocols, Ultra SCSI provides for data-transfer rates of up to 20 MBps with standard 50-pin connectors and 40 MBps with the 68-pin or 80-pin connectors currently used on Fast and Wide drives. While there are no hardware changes to implement, Ultra SCSI limits the total length of a chain's cabling to 1.5 meters (about 4.5 feet). Seagate, Quantum, and Hewlett-Packard have all announced that they will support Ultra SCSI; Quantum has further announced that in the first quarter of 1995 it will produce Ultra SCSI versions of its 2.1GB and 4.3GB Grand Prix drives.

A ways further along the technology spectrum, the FC-AL technology promises data-transfer rates in the 100-MBps range, and Seagate's new 3.5-inch, 4.3GB Barracuda 4FC will come with an FC-AL interface built in. However, users are unlikely to see products with this kind of performance until early 1996, as FC-AL requires costly special physical interfaces on both the drive enclosure and the host machine. Quantum and Hewlett-Packard have also announced that they will support FC-AL.

The third member of the SCSI-3 family, Serial Storage Architecture (SSA), is backed *continues*

In Brief

Stacking Up with RAID

Microtech unveiled its Power-Raid line of RAID Level 0 and Level 1 disk arrays using its new MicroLynx stackable storage units. Due in early February, systems will come in 2GB ($4186) to 8GB, Wide ($9477) arrays. Fast and Wide arrays include Atto Technology's SiliconExpress IV SCSI adapter board and ExpressStripe or ExpressMirror software.

The MicroLynx cases give Microtech drives a stacking form factor, using special short SCSI and power cables to make setup simple. Microtech also sells single drives and tape units in the MicroLynx units. 203/468-6223.

Personal Button Bars

Billed as a "personal button-based interface," Westcode Software's $130 OneClick combines the convenience of button bars with the power of a proprietary scripting language. Buttons can be created for a variety of uses for any Macintosh software application, including the Finder. 619/487-9200.

Newton with a Radio

Motorola has introduced Marco, the latest addition to the Newton ranks. Inside a matte black, paperback-book-size, folding case, the Marco is nearly identical to Apple's Message-Pad 110. It's fully compatible with all Newton applications and most peripherals; it has a standard infrared beaming port, an AppleTalk-compatible serial port, and a PCMCIA (PC Card) Type 2 slot; and it uses a nickel-cadmium battery that provides eight hours of average use. The big difference is that Motorola has added a two-way radio modem for use with RadioMail and the Ardis network. Using bundled applications, users can send and receive Internet mail, send faxes, and receive stock quotes and news bulletins. Motorola expects the Marco to retail for $900 to $1400. 800/947-3537.

by IBM with its newly announced 3.5-inch, 8.7GB Ultrastar2 XP and several previously announced drives in the Ultrastar line. SSA technology promises data-transfer speeds as high as 80 MBps with less expensive interfaces than FC-AL.

Apple and Maxtor have both announced support for P1394—for more information see "Will FireWire Replace SCSI?" (*News*, March 1994). But when it comes to actual products, FireWire appears to be trailing the rest of the pack. A Maxtor spokesperson said that finished products based on FireWire would not appear until late 1995 or early 1996.
—CAMERON CROTTY

Macs Sound Off

AUDIO ROUNDUP

Most people think of Macs as graphics machines, but they're a force in the audio world, too. At last November's Audio Engineer Society convention in San Francisco, audio professionals listened to the latest Mac-based audio tools.

A pioneer of Mac digital audio, Digidesign (415/688-0600), introduced the Pro Tools III, the newest in its series of high-end audio workstations. A combination of hardware and software, the Pro Tools III system enables NuBus-equipped Macs to record, play, and digitally process up to 16 tracks of CD-quality audio. Pro Tools III lists for $7990. An expansion kit adds an additional 16 tracks. It lists for $4995. Expansion kits can be combined for a total of 48 tracks.

Waves (615/588-9307) released Pro Tools III–compatible updates of its highly regarded sound processing plug-in modules. These include the $600 Q10 Parametric Equalizer, which boosts or attenuates certain frequencies to enhance a recording, and

Digital Expressions' SoftSplice digital-audio editor (bottom) supports 4-track recording and playback.

the $800 L1 Ultramaximizer, which processes recordings to provide the highest sound quality at a variety of sampling resolutions (it's popular among multimedia producers). Waves also shipped its new, $700 C1 Compressor/Gate, a plug-in that adjusts the dynamics of a recording to add punch and improve sound quality. And the company introduced WaveShell, a $100 program that lets you use Waves plug-ins independent of Digidesign's recording software. WaveShell—and all three Waves plug-ins—work with all Digidesign digital-signal processing (DSP) hardware, from the Audiomedia II card to the new Pro Tools III system.

Waves said it is currently creating versions of all three processing tools that will plug into Adobe Premiere—great news for video and multimedia producers. Better still, the planned Premiere plug-ins will not require Digidesign DSP hardware when run on Quadra 660AV and 840AV machines.

The Adobe Premiere audio plug-in format will also be supported by a future version of the $399 Deck II multitrack recording program by OSC (415/252-0460; see *Reviews, Macworld*, June 1994). The new version will also provide built-in equalization and other digital effects and is slated to ship in the first quarter of 1995. In the meantime, OSC has shipped Deck II 2.2, which runs native on Power

Macs and supports up to 12 tracks on a Power Mac 8100, 10 tracks on a 7100, and 8 on a 6100. (The Quadra 840AV is limited to 8 tracks.) The upgrade is free to Deck II 2.1 owners and costs $50 for Deck II 2.0 owners.

Digital Expressions (206/389-9895) introduced a new version of its $1895 SoftSplice digital-audio editor, a dictionary-size box containing DSP hardware that enables 4-track digital record-

ing and playback. While other firms' DSP hardware installs in a NuBus slot, the SoftSplice connects to a Mac's SCSI port—it even works with PowerBooks. One catch: the base unit contains only digital input and output; if you need to record an analog signal (such as that coming from a microphone) you must connect the SoftSplice to a digital audiotape recorder or to Digital Expressions' $995 digital-to-analog converter. The new version's included software provides enhanced editing tools and better support for SMPTE time code.
—JIM HEID

Check out the elegant detail of the Knopf Travel Guide to London *at your local bookseller, where you'll also find Knopf Guides to other world cities.*

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Color is color, until you see the fine print.
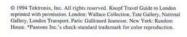
Then you'll know it's Phaser Color. Eyeball it up close. Check out the spotless color of the new Phaser™ 440, the newest continuous tone color printer from Tektronix. It dots i's and crosses t's with the precision of TekColor™ Photofine™ and true Level 2 Adobe® PostScript.™ Stunning overhead transparencies. Matchless pre-film proofs. All printed to Pantone®* Color perfection. And it's fast, processing images at RISC-speed, it snaps out 8½" x 11" full bleed prints. PCs, Macs, workstations, networks: it supports them all—simultaneously. And it's from Tektronix, the Fortune 500 leader, where quality in workgroup color printers starts at only $2,995 and persists to the last detail.
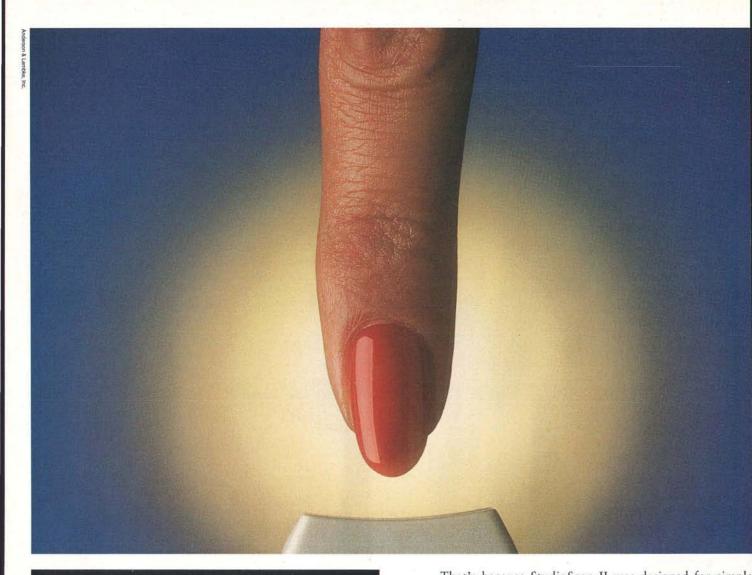
Tektronix

Circle 143 on reader service card

WHAT OUR ENGINEERS HAD IN MIND WHEN WORKING ON OUR NEWEST SCANNER.

Introducing the Agfa StudioScan II.

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That's because StudioScan II was designed for simple operation. Two levels of scanning software are built in — easy-to-use Agfa FotoSnap and comprehensive Agfa FotoLook. Plus, our exclusive, 42-page *Introduction to Digital Scanning* will guide you through the scanning process.

What's more, every StudioScan II comes complete with Agfa FotoTune LE color management software and our IT-8 reference target, along with Adobe PhotoShop™ LE and OmniPage Direct™ OCR software. All in a 400 x 800 ppi, 30-bit, one-pass scanner. And all for about $1,000.

So if you want an easy way to bring a scanner into your office, all it takes is the new StudioScan II. And your finger. Call 1-800-685-4271, ext. 2743 to find out more information on Agfa's new scanners.

AGFA ◆ *Agfa*

The complete picture

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Circle 158 on reader service card

Power Mac News

Long Road to a Native OS

MARCONI, COPLAND TO ADD NATIVE CODE

Since System 7.5 is Power-PC-native, you may think your Mac can now fully exploit the potential of the Power-PC. But System 7.5 still contains more 680X0 code than PowerPC code, the reason for slowed performance in some areas, and it will be several years before Apple has a version of its system software that is mostly native.

Many important portions of System 7.1.2 and 7.5—particularly QuickDraw—are written in native code. Still, in the core portions of System 7.1.2, just 17 percent (39 of the 235 processes) are native, while in the Toolbox supplemental processes, just 23 percent (191 out of 821) are native. System 7.5 has just slightly more native code than 7.1.2. Apple says that most software relies mainly on the parts of the Mac OS that are already native—but Apple refuses to estimate what percentage the time spent in native parts of the operating system might actually be.

Although 680X0 code does not run optimally on a Power Mac, frequent switching back and forth between emulation and native code runs even slower. As a result, in System 7.5 Apple actually changed a few native-code portions of System 7.1.2 back to 680X0 code to reduce the switching penalty.

How much faster would a Power Mac run if the entire System 7.5 were native code? No one knows for sure; sys-tem-software developers estimate anywhere from a 25 percent improvement for CPU-intensive applications to a 50 percent or greater improvement for disk-intensive applications (since much of the I/O processes in System 7 are 680X0 code).

Even if you use native Power Mac software, your system may be slowed down by 680X0 components added to the Mac OS in the form of extensions and control panels. Both the freeware program PowerPeek (available on the online service ZiffNet/Mac) and the $79.95 Conflict Catcher II 2.1 program (from

Casady & Greene, 408/484-9228) show which extensions and control panels may be slowing native applications by replacing native code with 680X0 code. But again, not all such situations will appreciably slow the Mac.

Unmasking Marconi Eventually these issues will go away as Apple moves toward an all-native operating system. Marconi, the code name for the System 7 update scheduled for a mid-1995 release with the first PCI-based Power Macs, contains about one-third native code. Marconi will have a native-code device manager, which will handle all the system hardware outside the CPU and RAM. It will also have an optimized emulator for 680X0 code on the PowerPC that will convert blocks of 680X0 code into native form and save the blocks in RAM for reuse. (The System 7.5 emulator deals with 680X0 code only one instruction at a time and does not save any work.) This improved emulator may only run on Macs using the PowerPC 603 and 604 CPUs—not on the earlier 601 CPUs. (Only one of the first PCI Power Macs is likely to use a 604, but all PowerPC PowerBooks are likely to use a 603.)

Connectix plans to offer similar emulation improvements for current Power Macs in an as-yet-unnamed program scheduled to be released in February 1995.

Composing Copland Apple is expecting Copland, the code name for the major revision of the Mac OS, to be 95 percent native code, according to the company. However, some Apple programmers privately say that the native-code portion will fall far short of 95 percent but should still be more than 50 percent. Copland will have native code for such key areas as the File Manager, which creates and reads disk files.

Because of many changes in its design and because of native code, Copland could run twice as fast as System 7.5 for some applications, Apple says, although such early estimates are tenuous at best.

Both versions are expected to provide important new features, including preemptive multitasking, which is long overdue for the Mac. But the native PowerPC version should go a long way toward realizing the potential of the Power Mac already on your desk.—CARY LU

Power Watch
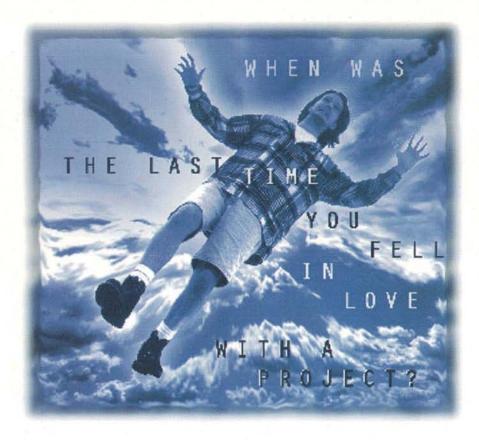
THE LATEST ON PRODUCTS FOR THE POWER MACS

Datawatch Corporation has shipped Virex 5.5 with SpeedScan, a $100 antivirus utility. Upgrades cost $25. 508/988-9700.

• DayStar Digital has begun shipping its Turbo 601 accelerator card for the IIci. The card, which requires System 7.5, includes a 66MHz PowerPC 601 CPU and should provide equivalent performance to that of a Power Mac 6100/60. The company's estimated price is $1199, but DayStar says it will lower the price once the initial demand has been satisfied. 404/967-2077.

• Design Science has announced MathType 3.1, a $199 equation-editing add-in for Microsoft Word, Word-Perfect, MacWrite Pro, Full-Write, and Nisus Writer. Upgrades from version 3.0 cost $29.95. 310/433-0685. —GALEN GRUMAN

Datawatch's Virex 5.5 uses native Power Mac code to speed virus scans.

DOUG ROSS

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SPIGOTPOWER AV. FULL-MOTION, FULL-SCREEN VIDEO FOR AV MACS

radius
SUPER**MAC**

Macworld Online

by Macworld Online Staff

Have you ever wished that you could simply and quickly search back issues of *Macworld?* Are you frustrated with shareware libraries that offer poor-quality files? Would you like to post a Macintosh-related question and get an answer (or ten) within 24 hours? How about a chance to exchange views with some of the major writers, analysts, and developers in the industry?

Macworld Online offers all this and more. In addition to electronic access to *Macworld*'s excellent print editorial, look for supplemental sidebars, bibliographies, and additional Macworld Lab results.

Steve Costa, founder and former executive director of BMUG, oversees our message boards and bustling shareware libraries. On Tuesday evenings we host live events that feature editors, authors, developers, artists, and industry pundits (see the calendar at right). Also, we invite developers to post product demos and software upgrades.

And this is just the beginning. Today you will find us on AOL and eWorld (keyword Macworld on either service). Soon we'll be launching our own Internet site, complete with Gopher, FTP, and World Wide Web capabilities. Join us online!

Internet Update

In our quest to design the best possible Internet server, we've been combing through hundreds of Web sites. We discovered that while many do an excellent job of linking content in a coherent and use-

ful manner, few acknowledge online realities (that is, snail-like data-transmission speeds) when integrating graphics.

WEB graphics must be presented efficiently in the first place, and be worth the wait in the second place. Not surprisingly, it is the art community that has evolved some of the best online graphic presentations. Here are the universal resource locator (URL) addresses for a few of our favorites.

For a sweeping survey of classic art, a nicely paced tour of the Louvre resides at http://mistral.enst.fr/~pioch/louvre. The more narrowly focused D. G. Rossetti HyperMedia Archive elegantly melds digi-

tized images of the pre-Raphaelite's paintings with his poetry and prose at http://jefferson.village.virginia.edu/rossetti/rossetti.html.

Another graphically rich site—ArtServe, at http://rubens.anu.edu.au/—is the brainchild of Michael Greenhalgh of the Australian National University, which houses nearly 3000 prints from the fifteenth to the nineteenth centuries.

For a modern fix, the Andy Warhol Museum Home Page resides at http://www.antaire.com/warhol. And a more commercial site, Kaleidospace, offers artists the chance to sell their work online at http://kspace.com/.

Shareware Picks

Recognizing that not all shareware is created equal, Macworld Online culls the shareware universe for files that are truly useful, robust, and entertaining. Here are a few of this month's favorites, along with their approximate sizes and shareware fees.

The menu-based launcher Apollo 1.12 by Jeremy Roussak swiftly opens applications, documents, control panels, desk accessories, and Finder folders (331K; $30).

High Risk Ventures' Cyclone 1.2.1 evokes the mood and excitement of the classic arcade game Star Castle, complete with a wraparound screen, rotating shield rings, and a nasty plasma cannon (950K; $10).

Those who persist in hunting and pecking might well find that Typing Tutor JR2.1.1 from W. Rogers is just the ticket for improving keyboard speed and accuracy (102K; $9.95). Like a magic briefcase, David Darby's DeskMates 1.3.3 opens to reveal a notebook, clock, stopwatch, calculator, calendar, scheduler, and address book (338K; $20).

Macworld Online sez: Support a starving code-artist —pay for your shareware!

LIVE-EVENTS CALENDAR

Each Tuesday evening, *Macworld* sponsors live events that bring the industry's leading pundits and developers to your desktop. We invite you to join us for lively repartee and behind-the-scenes gossip. Bring questions, critiques, and your own experiences. All times are Pacific standard time.

Macworld Lab Unveiled
February 28, 6 p.m. AOL
Join the Macworld Lab staff for an inside look at the rigors and travails that accompany the testing of Mac-related products. Offer kudos, gripes, feedback, and suggestions.

Troubleshooting with Pogue
March 7, 6 p.m. AOL
Macworld's Desktop Critic author, David Pogue, invites you to pose your trickiest Macintosh-related questions in this troubleshooting free-for-all.

Ask Cary Lu
March 7, 7:30 p.m. eWorld
Contributing editor Cary Lu brings considerable expertise to his question-and-answer fest. PowerBooks are his *Macworld* specialty, but at this event any Macintosh topic is fair game.

An Evening with the Residents
March 14, 6 p.m. AOL
Tonight's guests, the Residents, always perform incognito, but those interested in learning more about the Macintosh-based artistry behind CD-ROMs such as Freakshow and Gingerbread Man ought to tune in.

Security on the Net
March 21, 6 p.m. AOL
Contributing editor Steven Levy offers insights into the various security dilemmas plaguing the online world—privacy, piracy, and cybermoney.

Tom Knows Best
March 21, 7:30 p.m. eWorld
Macworld contributing editor Tom Negrino knows his way around a Macintosh, and he's more than willing to share his knowledge with those who attend this event.

Future Macs
March 28, 6 p.m. AOL
Macworld executive editor Galen Gruman discusses upcoming features to be found in Macintosh operating systems. Come prepared with questions, wish lists, and advice for Apple.

REACHING MACWORLD ONLINE

America Online and eWorld
Keyword is Macworld

There's the one

where you're suddenly standing onstage

at the senior prom wearing only really

big underwear and a fez.

And everyone is laughing hysterically,

including Mr. Dimnitz,

your guidance counselor.

Then there's the one

where your computer's

hard drive fries 30 minutes before the big

presentation, and you've

lost everything.

New Products

THE LATEST MACINTOSH RELEASES

by Cameron Crotty

HARDWARE

2082DC

This 20-inch color monitor features a 1600-by-1280-pixel maximum resolution, a vertical refresh rate up to 90Hz (75Hz at most common resolutions), a 0.28mm dot pitch, and adjustable color intensity. The 2082DC is Energy Star–compliant and meets the Swedish MPR II emissions guidelines. A required adapter comes separately but is free from the company. $1399 estimated street price. Optiquest, 909/468-3750, 800/843-6784; fax 909/468-3770.

2082DC

4000TC and 4500DC

It may not be in the same league as the Mac-versus-PC holy war, but with these 17-inch color monitors Optiquest has both sides of the Trinitron-versus–shadow-mask debate covered. The 4000TC is a Trinitron display with a 0.25mm aperture pitch, a maximum resolution of 1280 by 1024 pixels, and a vertical refresh rate up to 90Hz (75Hz at most common resolutions). The 4500DC is a 17-inch color monitor with a 0.28mm dot pitch, a 1600-by-1280-pixel maxi-

mum resolution, and a vertical refresh rate up to 100Hz (75Hz at most common resolutions). Both monitors are Energy Star–compliant and meet the Swedish MPR II guidelines. 4000TC $849 estimated street price; 4500DC $795 estimated street price. Optiquest, 909/468-3750, 800/843-6784; fax 909/468-3770.

CA0913DS

Sometimes you need full resolution in a small space. This 9-inch, multiresolution color monitor displays up to 1024 by 768 pixels and features a dot pitch of 0.28mm and a maximum vertical refresh rate of 100Hz. The display is Energy Star–compliant and meets the Swedish MPR II emissions guidelines. $529. Smile International, 714/546-0336; fax 714/546-0315.

CA2011 and CA2111

For an expanded perspective on your work, you could take a four-month sabbatical—or you might just try a larger monitor. The CA2011 is a 20-inch multiresolution color monitor with a maximum resolution of 1280 by 1024 pixels, a vertical refresh rate up to 120Hz (75Hz at 1154 by 768 pixels), and a 0.31mm dot pitch. The 21-inch CA2111 has a maximum resolution of 1600 by 1280 pixels, a vertical refresh rate up to 120Hz (75Hz at 1154 by 768 pixels), and a 0.28mm dot pitch. Both models have digital LCD controls, 9 factory presets, and memory for 27 user-programmable settings. Both are Energy Star–compliant and meet the Swedish MPR II guidelines. CA2011 $1099; CA2111 $1699. Smile International, 714/546-0336; fax 714/546-0315.

CT-21B and CF-17A

The larger of these two multiscanning color monitors is the CT-21B, a 21-inch DiamondTron display with a 0.30mm aperture pitch and a 1600-by-1200-pixel maximum resolution. The CT-21B has 12 digital controls for image adjustment, including color temperature; users can also plug into the display's ADB port and control the monitor with the included software. The CF-17A is a 17-inch display with a 0.28mm dot pitch, 1280-by-1024-pixel maximum resolution, and a vertical refresh rate up to 90Hz. The CF-17A also has digital controls. Both monitors are Energy Star–compliant and meet the Swedish MPR II emissions guidelines. CT-21B $2495; CF-17A $899. Ikegami Elec-

tronics USA, 201/368-9171, 800/368-9171; fax 201/368-1305.

DiskStor Drives and Arrays

Conner Peripherals has announced a line of high-capacity internal and external drives and a set of two-drive arrays based on those drives. The single drives have SCSI-2 Fast interfaces and come in capacities of 1GB (9ms average access time, 7-MBps sustained data-transfer rate); 2GB (8.5ms average access time, 11-MBps sustained data-transfer rate); and 4GB (8.5ms average access time, 11-MBps sustained data-transfer rate). The disk arrays come in 2GB, 4GB, and 8GB sizes (8GB available in external only); they are available with SCSI-2 Fast and SCSI-2 Fast and Wide interfaces and include software that enables striping (RAID 0). The internal kits are designed for use with the Power Macintosh 8100 and 8150. Fast and Wide arrays ship with a NuBus SCSI-2 adapter. Prices range from $689 to $3825. Conner Peripherals, 408/456-4500, 800/426-6637; fax 408/456-4501.

DiskStor External Drive

Genesis 230

As capacities increase, access times decrease, enhancing the desktop viability of optical media. The Genesis 230 is a 3½-inch removable-cartridge SCSI optical drive with a 44ms access time and a sustained data-transfer rate of 900 KBps. The drive comes with Microtech's DiskForce formatting software, which is compliant with SCSI Manager 4.3. External $1163; internal $1098. Microtech International, 203/468-6223, 800/626-4276; fax 203/468-6466.

MacClass 288MT II and 288LCD

Burning up the phone lines, these V.34 fax modems can transmit and receive data at 28.8 Kbps and faxes at 14.4 Kbps. They support a complete array of ITU-T data standards, including V.32 (14.4-Kbps data speed), V.42 (data compression), and V.42bis (error correction). The units also support the V.17 fax standard and Group III faxing. Both modems are external, and the 288LCD

MacClass 288LCD

model includes a three-line LCD status display. Both models ship with Practical Peripherals' MacComCenter software. 288MT II $279; 288LCD $459. Practical Peripherals, 805/497-4774, 800/442-4774; fax 805/374-7200.

MultiSync XV15

This 15-inch multiresolution color monitor features a 0.28mm dot pitch and has a maximum resolution of 1280 by 1024 pixels at a vertical refresh rate up to 100Hz (most Mac resolutions are supported at 76Hz). The display has controls for image size, position, and appearance; is Energy Star–compliant; and meets the Swedish MPR II emissions guidelines. $455. NEC Technologies, 708/860-9500, 800/632-4636; no fax.

Personal Archiver System

Now you can archive your data twice as fast, with this SCSI system. The heart of the Personal Archiver System is a JVC double-speed CD-ROM recording drive. A 1GB hard drive sits in the same case; users feed data onto the hard drive and then use the included software to record it on CD-ROM in one of several formats (High Sierra, ISO 9660, Mac HFS, and CD Audio). A system with a quad-speed drive is also available. Double-speed $4095; quad-speed $6895. Marcan, 206/635-7477, 800/635-7477; fax 206/635-7479.
continues

Personal Archiver System

PersonalLFR Plus

You can make your own color slides from your desktop Mac with this 4000-line, 33-bit color film recorder. The SCSI PersonalLFR Plus has a permanently mounted 35mm camera back, can produce slides in roughly 60 seconds, and ships with Lasergraphics' MacRascol control software. $5995. Lasergraphics, 714/753-8282, 800/727-2655; fax 714/727-2653.

PocketPac

PocketPac

Start with a 2.5-inch SCSI hard drive mechanism, wrap a case around it, and you've got a PocketPac drive. Roughly the size of a pocket calculator and weighing about 12 ounces, the Pocket-Pac comes in 320MB and 500MB sizes; each has an average access time of 25ms and a sustained data-transfer rate of 1.7 MBps and 1.9 MBps, respectively. The drives come with cables and Microtech's DiskForce formatting software. 320MB $854; 500MB $1080. Microtech International, 203/468-6223, 800/626-4276; fax 203/468-6466.

Precision Disk Arrays

Mirror has announced a line of arrays ranging from two-drive, 2GB units that support RAID levels 0 and 1, up to ten-drive, 90GB arrays that support RAID levels 0, 1, 4, and 5. All arrays come with the company's SCSI-2 Fast and Wide accelerator card. RAID software by Remus resides on the host Macintosh and handles the RAID duties. The software provides complete control over RAID parameters, and users can configure multiple RAID volumes over a single array. Prices range from $3000 to $22,000 depending on configuration. Mirror Technologies, 612/270-2718, 800/654-5294; fax 612/633-3136.

Proxima 8400

You never know when that small presentation to a couple of your coworkers will turn into a full-blown event with about 150 of your closest friends. You'll be covered with the Proxima 8400—it can project an image as small as 25 inches (diagonal), or as large as 300 inches. The 8400 uses an active matrix color

Proxima 8400

LCD panel (16.7 million colors) and has a resolution of 640 by 480 pixels. The projector also accepts video input (NTSC, PAL, SECAM, and S-VHS) and can be expanded with Proxima's Cyclops interactive pointer system. With this system and a special pointer, you can control your Mac directly from the projected image. $10,795; with Cyclops $11,990. Proxima Corp., 619/457-5500, 800/447-7694; fax 619/457-9647.

QMS 3825 Print System

You wouldn't ask Pee-wee Herman to lift a car—but are you asking your 6-ppm laser printer to carry your entire department? The QMS 3825 is a 38-ppm, 600-by-600-dpi laser printer that handles materials up to 11 by 17 inches. $21,999. QMS, 205/633-4300, 800/523-2696; fax 205/633-4866.

Trinity PowerPak

You can't flick on the afterburners when you're using your Power Macintosh, but you can give your machine an extra burst of speed. The Trinity PowerPak clips on over the clock chip of your Power Mac 6100/60, 7100/66, or 8100/80, accelerating the machine to 80MHz, 80MHz, and 100MHz, respectively. A 29MHz chip is also available for the Quadra and Centris 610. PowerPak 61/80 $119; 71/80 $129; 81/100 $149; Q(C)/29 $109. Trinity Works, 512/338-9536, 800/278-4944; fax 512/338-1992.

UP-D8800 and UP-5500

There's a better way to get fast, realistic

UP-5500

color output than running to a one-hour photo lab. Both of these 300-dpi color dye-sub printers are PostScript-compatible. The UP-D8800 handles materials up to A4 size (8.25 by 11.75 inches) and can print single pages in less than 90 seconds. The UP-5500 is A5-size (5.88 by 8.25 inches) and can print at 30 seconds per page. UP-D8800 $7995; UP-5500 $7495. Sony Corp. of America, 201/930-1000, 800/472-7669; no fax.

Aladdin Desktop Tools

You can never have too many utilities. This package contains seven utilities, including Desktop SpeedBoost, which accelerates copying, duplicating, and trashing items. Desktop Shortcut places priority files and folders in a menu in the Open and Save dialog boxes. With Desktop Viewer, you can see GIF, PICT, text, and other files directly on the desktop. You also get Desktop SecureDelete (erases sensitive files), Desktop Magic-Tools (works with the StuffIt Magic *continues*

Circle 249 on reader service card

Get With The Program
1200 x 1200 dpi, Adobe PostScript Level 2, At the Unbelievable Price of $3,495.

To succeed, you need a winning program. And as Bo will tell you, a little muscle doesn't hurt either. XANTÉ® offers both with the NEW *Accel-a-Writer®️ 812*. This high-resolution laser printer is engineered with print-intensive workouts in mind. With 1200 x 1200 dpi, and true Adobe™ PostScript™ combined with a fast 33 MHz AMD 29030 RISC processor, you'll have all the power and flexibility you need to stay ahead of the competition — and at a price that won't weigh you down. So, if your success depends on the quality of your output, you better get with the program.

XANTÉ's Winning Program

√ 1200 x 1200 dpi for exceptional halftones and incredibly smooth text and graphics

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√ Simultaneous interfacing between LocalTalk®, Centronics® parallel, and RS-232 serial

√ HP PCL® 5 and HP-GL® 7475A emulations

√ Ethernet® networkability, with concurrently active EtherTalk® and TCP/IP, as an option
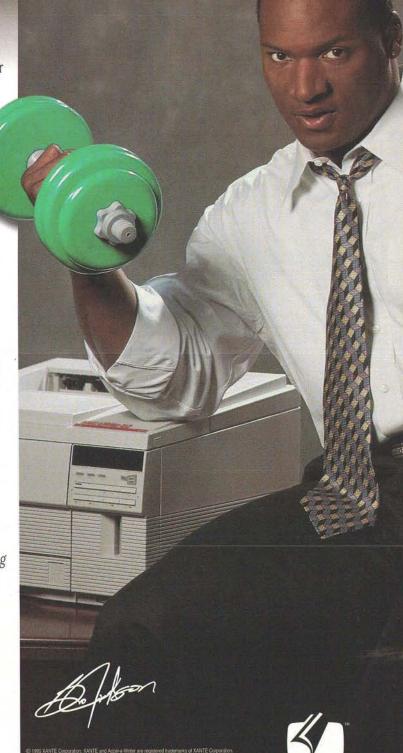
√ Supports letter, legal, A4, B5, and executive paper

XANTÉ's Accel-a-Writer 812 — *it has our competition scrambling for the gym!*

For immediate output results call XANTÉ today.

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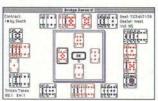MasterCard/Visa/American Express/Discover

XANTÉ
Innovations In Output

Adobe PostScript

Circle 112 on reader service card

New Products

Menu), Desktop Makeover (derived from the SpeedyFinder7 shareware utility), and Desktop Printer (printing tools). 2MB min. memory; requires System 7. $89.95. Aladdin Systems, 408/761-6200; fax 408/761-6206.

Bridge Baron 6.0 for Macintosh

Bridge Baron 6.0 for Macintosh

With this software, you won't need to worry about finding a fourth for a rubber—or a third or second, for that matter. Users can play against Bridge Baron alone or with friends; in either case, the software tracks bidding and playing statistics. Bridge Baron recognizes limit major raises and the Jacoby 2NT raise. You can also customize how Bridge Baron plays. $59.95. MicroLeague Interactive Software, 302/368-9990, 800/368-6672; fax 302/368-8600.

Instant Replay

Instant Replay

Still-image screen capture is passé. You can record your screen actions in living motion (at roughly 8 to 9 frames per second) with this capture utility. Instant Replay makes QuickTime movies of your screen, recording everything from cursor movements to window and menu use. There's a cursor-track recording option—you can set a custom view size that tracks the movement of the cursor, creating smaller movies that focus on areas of interest. Instant Replay can also capture video and audio from internal or external sources (quality depends on the machine's speed). 4MB min. memory; requires System 7. $149. Strata, 801/628-5218, 800/869-6855; fax 801/628-9756.

QuikDraft

Couldn't you use a little more organization in your life, particularly when it comes to sorting through the scraps of paper you usually take notes on? Quik-Draft is designed to help you take and organize notes. You can begin by creating a formal outline with topics, or you can just start creating notes and link them to topics along the way. You can easily rearrange topics in the outline to better display related information, and opening a topic brings up all the associated notes. $34.95 estimated street price. Donner Lake Software, 916/587-7450, 800/916-7450; fax 916/587-7450.

◀ **Sensory Overload**
Have you ever awakened in the middle of a medical facility, surrounded by dead bodies and terrorists? If not, you probably haven't played Sensory Overload, a first-person action arcade game. As you race down hallways, gunning down guards and evildoers, you must find the AlphaChannel unit and uncover the secret plans of Dr. Craven. Oh, and by the way, don't forget to stay alive. 2.5MB min. memory; requires Mac IIsi, 13-inch monitor, 8-bit color. $69.99. Reality Bytes, 617/621-1555; fax 617/577-1209.

SimTower

Maxis moves from the macro to the micro with its latest Sim toy. In SimTower, you're a real estate tycoon attempting to build a skyscraper and achieve financial success by leasing out space for offices, restaurants, condos, shops, and hotels. You can track individual people, monitoring their stress levels to learn how to improve your building. You'll experience all the fears of a modern landlord, including fires, terrorist threats, and complaints from angry tenants. 4MB min. memory; requires 68030 Mac, 8-bit color, System 7. $44.95 catalog price. Maxis Software, 510/254-9700, 800/336-2947; fax 510/253-3736.

TypeTamer

You may occasionally feel like using a whip and chair on your fonts, but you'll probably get better results with this font-management software. TypeTamer displays the fonts used within a document at the top of the Font menu; puts the font's icon next to its name; and shows the selected font's character set, including any special characters, in a hierarchical menu within the Font menu. Key-combination–phobic users can select characters directly from the hierarchical menu, and fastidious users can organize fonts in custom groups within the Font menu. $59.95. Impossible Software, 714/470-4800; fax 714/470-4740.

The Yukon Trail

The Yukon Trail

With this package you can visit another stretch of American history in the spirit of MECC's The Oregon Trail. Strike it rich in the Yukon as you learn about the geography and culture of Alaska and Canada. You weigh advice from famous historical figures and decide what supplies you need before striking out across the Yukon countryside in search of gold. A CD-ROM version is also available. 4MB min. memory; requires LC III, 13-inch color display, System 7. $59.95; CD-ROM $69.95. MECC, 612/569-1500, 800/685-6322; fax 612/569-1551.

CD-ROMS

Avatar

Like any great strategy game, chess has simple rules but nearly endless complexity. Avatar updates this classic with five variations on the theme. Changeling Chess, Quad, Capablanca, Nuclear, and *continues*

Kamikaze all challenge chess aficionados and novices alike with new twists on an old game. $59.95. Changeling Software, 203/292-5087, 800/769-2768; fax 203/292-5089.

Mountainscapes and Skyscapes

The latest volumes in this collection of stock photography cover expanses of earth and sky. Mountainscapes (Volume 5) contains 80 images of mountain peaks and valleys from around the world. Skyscapes (Volume 6) has 85 images of the skies at morning, noon, and night, in fair weather and foul. All images are on disk in high-, medium-, and low-resolution formats; high-resolution images are 1330 by 1995 pixels (at 266-pixels-per-inch resolution) and are stored as RGB TIFF files. $59 per volume. Image Club Graphics, 403/262-8008, 800/387-9193; fax 403/261-7013.

Mountainscapes and Skyscapes

Past-Tints Sampler Edition

This collection of antique line-art illustrations can help give your designs a vintage look. The disc contains more than 300 illustrations in 9 groups: People, Garden, Illustrated Caps, Domestic Animals, Odds 'n' Ends, Transportation, Sea Life, Whimsy, and Wild Animals. Each file is saved as both a 1200-dpi and 300-dpi TIFF image. $79. Periwinkle Software, 909/593-5062, 800/730-3556; fax 909/593-6062.

Past-Tints Sampler Edition

The Personal Communicator

This disc combines a 1000-sign American Sign Language (ASL) video dictionary with communication and education programs. With the dictionary, you can look up words and get written and spoken definitions, as well as ASL translations. The package also includes a simple word processor and a vocabulary-building playroom. When you click on a picture in the playroom, the software shows an animation and the ASL sign of the object. $99. Michigan State University, 517/353-9229; fax 517/432-2650.

Textures of Italy

Bring a little bit of the old country to your designs with this disc of stock photography. Textures of Italy contains 100

Textures of Italy

images of textiles, food, glass, papers, marble, ceramics, architectural detail, rustic wood, and historic walls. Each file is saved in Kodak Photo CD format in five resolutions from 128 by 192 pixels up to 2048 by 3072 pixels. $225. Clip Shots, 416/863-1774, 800/551-3826; fax 416/863-6633.

ACCESSORIES

AudioTower

Multimedia just isn't multimedia unless the very air about you thrums with sound—not a likely occurrence if you're depending on the Macintosh's internal speaker. NEC's AudioTower powered speakers stand 10½ inches tall on your desktop and plug into the sound-out port of your Mac. The speakers are magnetically shielded. $100 estimated selling price. NEC Technologies, 708/860-9500, 800/632-4636; no fax.

CloseTake Lens Systems

Apple's QuickTake camera makes digital photography available to the masses, but the camera's 4-foot minimum focal range

closes the door on close-up photography. The heart of the CloseTake Close-Up System is an aluminum adapter that mounts in the lens opening of the Quick-Take and provides an industry-standard 39mm threaded opening. A variety of 39mm lenses and filters are available. The Close-Up System ships with a +3-diopter lens that reduces the minimum focal range to 2 inches; a Professional System with two additional lenses is also available, and the adapter can be purchased separately. Close-Up System $69.95; Professional System $134.95; CloseTake Adapter $34.95. Kaidan, 215/364-1778; fax 215/322-4186.

PowerBook Starter Pack

It's a little late for Christmas, but the PowerBook 100 user in your life might still appreciate this replacement nickel-cadmium battery and charger. The battery has gold-plated contact points and a manual switch that you set to let you know whether or not the battery is charged. The charger has space for a single battery and can recondition and charge a battery in roughly 1½ hours. $95. PowerWerks, 612/784-0701; fax 612/784-7862.

QuePoint

Don't get mad at PowerBook 500 owners for having a cool trackpad—get even. MicroQue's QuePoint trackpad works similarly to the ones on Apple's portable machines, and you can plug it into the ADB port of any Macintosh. The Que-Point has two buttons (left is click, right is click-and-lock), and you can also click *continues*

QuePoint

by tapping on the pad. $149.99. Micro-Que, 801/263-1883; fax 801/263-2886.

BOOKS

The Desktop Color Book, Second Edition

IIntended as a complete source of information on color desktop publishing, this book guides the reader through an overview of color theory and practice as implemented in desktop software, from scanning to separations to color printing. Authors Michael Gosney and Linnea Dayton show readers how to make the most of color with digital design and production tools. 130 pages. $19.95. MIS:Press, 212/886-9200, 800/488-5233; fax 212/633-0748.

Detour: The Truth about the Information Superhighway

Tired of being bombarded about the most-hyped intangible of the decade? This book attempts to cut through the noise to provide information about the information superhighway. Written by Michael Sullivan-Trainor and published by *Macworld*'s sibling company IDG
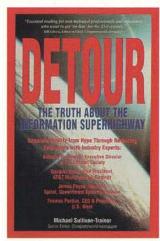
Books Worldwide, the book discusses the deployment, timing, and corporate players that will probably be involved in the highway's construction, and solicits insight from industry experts (including Vinton Cerf and Esther Dyson). The book also includes a guide to privacy, censorship, and government regulations. 319 pages. $22.99. IDG Books Worldwide, 415/655-3000, 800/762-2974; fax 415/655-3299.

Exploring Fractals on the Macintosh

With help from a team of programming, mathematics, and music experts, author Bernt Wahl leads the reader on an exploration of fractal science and the basics of chaos theory. The book discusses the nature of fractals and where they're found in everyday life. Readers also learn about image compression, calculating fractal dimensions, and creating fractal programs. A disk with fractal-creation software is included. 352 pages. $34.95. Addison-Wesley Publishing, 617/944-3700, 800/358-4566; 617/942-1621.

Inside the Information Superhighway Revolution

Who will control the electronic frontier? How much will it cost to build the information highway, and who will have to pay for it? These are two of the many questions that author Nick Baran attempts to answer in this book. He covers the current incarnations of the national information infrastructure (NII); their underlying technologies; and the eventual effects of the NII on business, education, and govern-

Detour: The Truth about the Information Superhighway

ment. 268 pages. $19.95. The Coriolis Group Books, 602/483-0192, 800/410-0192; fax 602/483-0193.

Love Bytes

There's a burgeoning social scene happening, where men and women are coming together to meet for friendship and romance. It's online, and it's populated and decorated with the imaginations of thousands of people. This book, subtitled "The Online Dating Handbook," teaches readers the basics of posting messages, sending and receiving E-mail, and placing online personal ads. Author David Fox also evaluates the hot

spots on the Internet and the commercial services and provides advice both on how to approach an intriguing netter and how to deflect online harassment. 357 pages. $18.95. Waite Group Press, 415/924-2575, 800/368-9369; fax 415/924-2576.

Protect Your Privacy: The PGP User's Guide

Sending data over the Internet is like sending a postcard through the U.S. mail: just about anyone can read it and, if determined enough, even change what the message says. This book is about a shareware program called PGP (Pretty Good Privacy) that uses public-key encryption along with the RSA encryption algorithm to help protect your message's integrity. Author William Stallings describes the principles behind PGP; gives instructions on obtaining the software from the Internet; and describes how to use it on Mac, Windows, DOS, Unix, and OS/2 machines. 300 pages. $19.95. Prentice Hall Computer Publishing, 515/284-6751, 800/947-7700; fax 515/284-2607. m

To have your product considered for inclusion in *New Products*, send an announcement with product name, description, minimum memory, peripherals required, pricing, company name, and phone number to New Products Editor, *Macworld*, 501 Second St., San Francisco, CA 94107. *Macworld* reserves the right to edit all product announcements.

WHEN

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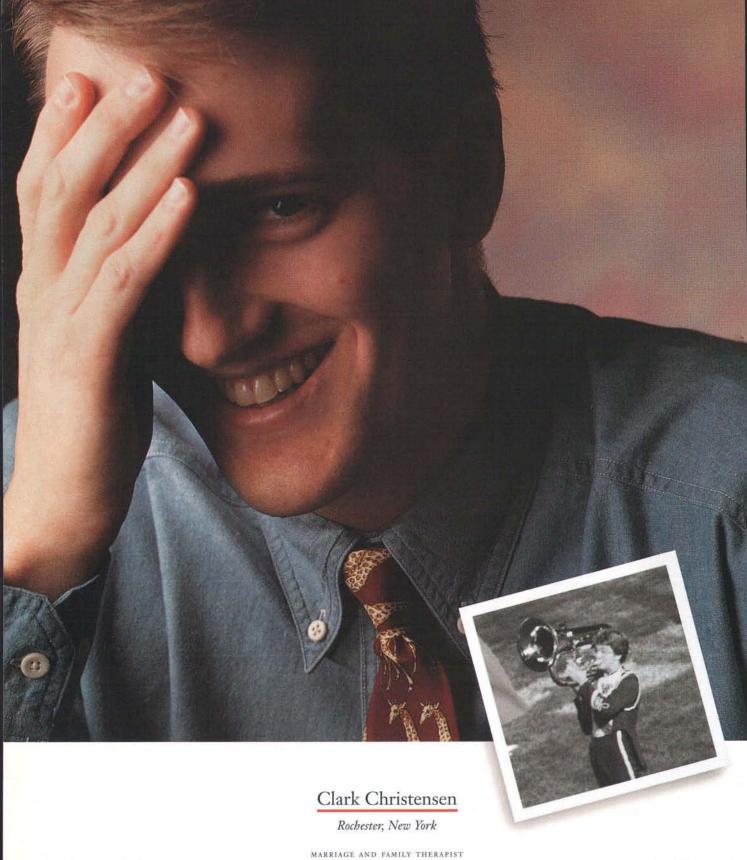It has the brains to keep you and your entire workgroup ahead of the competition.

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Clark Christensen

Rochester, New York

MARRIAGE AND FAMILY THERAPIST
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We all have some pretty strange things in our past.

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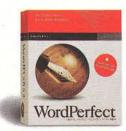
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Painter 3

STEVE CAMPBELL

FRACTAL DESIGN PAINTER has long been at the leading edge of graphics applications, offering a dynamic range of extraordinary natural-media painting options that no other Macintosh program has seriously attempted to reproduce. With version 3, the product has achieved a rare state of perfection, balancing enhanced conventional controls with spectacular effects packaged inside a tidy interface. The result is a piece of software that deserves a place on the hard drive of every professional artist and graphics enthusiast.

Painter Cleans Up Its Neighborhood

When it came to screen real estate, previous renditions of Painter amounted to unregulated urban sprawl. Every new feature seemed to bring with it a new palette chock-full of excessively large icons, encroaching on what screen space remained available for painting. This problem has finally been remedied by way of a complete interface restructuring that leaves few screen controls unmodified. While the palettes remain vast and intricate, their number has been reduced to eight, the icon size has been halved to the 32-by-32-pixel standard, and each palette has been reorganized and compartmentalized

in digestible chunks. A single palette, for example, offers access to color selection, gradations, and paper textures, all structured inside logical panels. As in previous versions, you can tear off panels if you want to access, say, color and gradation options at the same time. The exception is the Brushes palette, which no longer allows you to tear off brushes. The idea is that the brushes are small enough that you don't need to. Painter still offers more palette options than most folks will exploit in a lifetime, but now you can easily stow the ones you're unlikely to use, leaving plenty of room for the essentials.
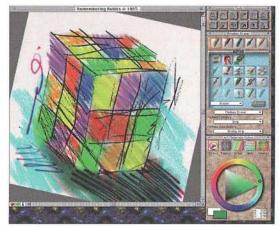
In addition to its collapsing and expanding palettes, Painter equips a few palettes with drawers, which allow you to access additional brushes, paper textures, and the like, making them available on a regular basis. For example, the Brushes palette gives you access to five commonly used brushes at all times. If you want

to access another brush, you just open the drawer and click on the brush you want to use. Painter deletes the least-used brush from the main five and puts the selected brush in its place. You can also make as many as four of the five main tools permanent; one must remain temporary so you can swap tools in and out of the drawer.

If you derive satisfaction out of personalizing your environment, you can customize the appearance of the interface by assigning different patterns to palettes, lining drawers with different colors, and even changing the position and softness of the drop shadows behind tool icons. You can choose from several predefined patterns on the Extras CD that ships with Painter or create your own pattern. Editing the interface may sound trivial, but it can actually help you to distinguish icons more clearly (see "My Own Private Painter").

New Dimensions in Natural Media

When it comes to providing a real-world artist's studio, Painter can't be beat. Version 3.0 builds on the program's natural-media capabilities in ways that both make sense and provide tangible benefits for its users. For starters, Painter 3.0 allows you to adjust the placement of the canvas on the screen. Just as you can rotate a real-life page to accommodate your personal style, Painter lets you rotate the screen canvas without affecting the orientation of the printed image. You can access the rotate-page cursor from the keyboard, making it easy to rotate between brushstrokes without missing a step. And you can make the page upright with a mouse-click. Naturally, you will not see every image pixel when the canvas is rotated—just as you can't see every pixel when you view the image at a reduced zoom ratio—but it is a great sketching and planning tool. You can also resize the canvas, move it without constraints in the full-screen mode, and change the color of the empty no-man's-land outside the canvas.

Painter's new gradation palette is second only to Gradient Designer, which is included with Kai's Power Tools from HSC Software, and much better than the gradation palettes included with other bitmap editors. In addition to accessing the standard linear and radial color ramps, you can access conical and spiral ramps, edit the angle of gradients, tighten or loosen spirals, and change the way colors blend. You can specify the first and last colors in a gradation using the expanded color wheel (borrowed from Fractal Design's introductory paint program, Dabbler) or lift a custom color ramp directly from an image. And if that's not enough, a frivolous but fun command lets you map a gradient onto a gray-scale image to create moderately diverting psychedelic effects.

Painter 3.0's most delightful new feature is Image Hose, which sprays out a continuous stream of predefined images. Each image is an independent floater, exploiting Painter/X2's ability to mix multiple floating selections in a single document. Portions of the floater can be translucent—as in the case of drop shadows—while other portions are opaque. Floaters are stored in collections called nozzles. You can choose from more than 50 predefined nozzles included on the CD that ships with Painter, or you can create your own. You can even specify that floaters spray out in a specific order or in relation to the direction of your mouse-drag. All in all, Image Hose represents a new milestone for generating

My Own Private Painter Among Painter 3.0's vast interface enhancements are the ability to rotate the canvas and to customize palettes' background textures. I've changed the main backgrounds to a marble pattern and the drawer linings to speckled blue, to distinguish brushes and paper options. The palettes still consume a fair amount of room, but you'll find yourself well served if you use a 16-inch or larger monitor.

background patterns; using one of the predefined nozzles, for example, you can paint a field full of cloverleafs that repeat entirely randomly, without regard for a rectangular grid or any other geometrical structure.

Although this arguably exceeds the boundaries of the program's natural-media territory, Painter 3.0 offers limited animation capabilities. It's straight Disney-style cel animation; you draw each frame by hand, one on top of another. Painter's Onion Skin feature lets you see up to five adjacent frames at a time (though you can work on only one of them at a time). You can also trace frames from recorded QuickTime movies, a technique known as rotoscoping. Painter isn't likely to attract professional animators, but you do have full access to the program's wealth of painting and masking tools, which is more than any animation application offers.

As If That Weren't Enough

Selecting and masking have received quite a bit of attention in Painter 3, above and beyond the options available in Painter/X2. Among the new masking functions is a Bézier-curve tool that can draw free-form lines or precise point-by-point shapes. The wealth of live selection functions—though something of a chore to get used to—are uniquely flexible, enabling you to call up any selection outline and even adjust the softness of a floater without dropping it onto the canvas. Painter offers several new calculations for combining floaters. And to its considerable credit, in Painter a floater doesn't invoke nearly as much of a performance hit as does a layer in Photoshop.

I can't begin to describe the rest of Painter's new functions in detail. The Weaves palette allows you to create tartanlike patterns that Fractal Design claims you can duplicate thread-for-thread using a conventional eight-harness loom. The Image Warp command lets you distort an image by dragging over a thumbnail from inside a dialog box. New dodge and burn tools lighten and darken areas to create highlights and shadows. You can now capture brush shapes to better emulate irregularly tipped tools like chalk and pastels, and you can imbue brushes with multiple colors, much as you might load a real paintbrush by rolling it on a palette.

No program is perfect, but my criticisms of Painter are minimal. A handful of commands—including Image Warp—require an FPU, preventing me from using those features on the road on my PowerBook 540c, for example. The Undo command is still not sufficiently sensitive, incapable of restoring a deleted floater or a moved selection outline. And Painter doesn't support JPEG compression, except when opening PICT files. While occasionally irritating, none of these problems interferes with the program's performance as a real-world painting environment.

The Last Word

Painter has never failed to amaze and amuse, but version 3.0 goes its predecessors one important step better by offering a new level of usability and genuine practicality. Quite frankly, this is the first Painter to join the ranks of such essential electronic design staples as Adobe Photoshop, QuarkXPress, and Adobe Illustrator. To its considerable credit, version 3.0 takes all the power and magic that have attracted folks to Painter in the past and enhances these qualities, repackaging them in a thoughtfully designed and logical interface. I wish the price hadn't increased—Painter 3.0 costs $100 more than version 2.0 and $200 more than version 1.0—but since the newest version integrates Painter/X2, which used to sell separately for $149, I suppose I can cut it some slack. And when you consider that the product still requires a modest investment compared with most mainstream design programs, there's no doubt that Painter justifies every penny. Quite simply, it's the best image-creation program I've ever seen.—DEKE McCLELLAND

Two Panasonic Speaker Systems

EAB401P Speakers

PROS: Compact design useful when desk space is slim. **CONS:** Very-poor-quality sound; severely underpowered amplifier; lacks separate input for external CD-ROM's audio jack. **COMPANY:** Panasonic Communications & Systems (800/742-8086). **COMPANY'S ESTIMATED PRICE:** $99.

MW ★

EAB701P Speakers

PROS: Compact design useful when desk space is slim. **CONS:** Poor-quality sound; underpowered amplifier; lacks separate input for external CD-ROM's audio jack. **COMPANY:** Panasonic Communications & Systems (800/742-8086). **COMPANY'S ESTIMATED PRICE:** $249.

MW ★★

PANASONIC, FOR YEARS A STRONG presence in the consumer-electronics industry, has introduced a new line of multimedia speakers with personal computers in mind. These Panasonic speakers, models EAB401P and EAB701P, are tall and thin, allowing for easy placement beside your monitor in a small work space. Unfortunately, they provide much less than state-of-the-art performance.

Typical multimedia speakers must be small, to fit comfortably on a computer desk. They have to be magnetically shielded, so their magnets don't cause any unsavory screen effects at the corners of your monitor. Stereo speakers are normally placed 6 to 8 feet apart and at least several feet from the listener, but multimedia speakers must be designed for near-field listening, so they can be placed maybe 2 feet apart and a similar distance from the listener. And finally, they must deal with the effect their small size has on bass reproduction (good bass depends in part on large speakers and heavy magnets). That's why some speakers come with a separate subwoofer module.

In testing the Panasonic speakers, I drew from a number of audio sources, including regular Mac system sounds, the online sounds generated in America Online and eWorld, some popular games (such as Brøderbund's Myst), and choice tidbits from my large collection of audio compact discs.

Model EAB401P

The Panasonic speaker systems have a decidedly different form factor than do other multimedia speakers (which look much like regular compact stereo speakers). In the EAB401P system—the smaller of the two—the modules are each 1⅓ inches wide and a bit over 5 inches high. Each module has a power switch, a power indicator, and a volume control. A single power supply has separate AC plugs for each speaker. A small plastic stand, rubber feet for stability on a smooth surface, and cables round out the package. A single set of input jacks is at the rear of each unit, and there is no provision for mixing the audio from an external CD-ROM and your Mac.

The EAB401P speakers each contain a pair of nonidentical horn speakers, with long, curving, oval tubes inside the body of the speaker case to enhance the bass reproduction, but they don't have much impact. The bass reproduction seems nonexistent. The sonic picture is not good. The audio is thin and reedy. There is no tone control to boost the low frequencies. The total of 4 watts of output power lets the speakers play at reasonable levels, but the harshness gets worse as you turn up the power. And the frequency response (the audible spectrum the speakers can reproduce) is very poor for a system of this sort.

Model EAB701P

The EAB701P speakers are just over 2 inches wide and about 10 inches high. They're attractive in a high-tech sort of way, with curves and ridges at both sides. Both the left and right modules include a rectangular cone speaker for midrange and high frequencies. The left module has a 3-inch woofer for bass reproduction; the right module contains the amplifier; jacks (one for the line input from your CD

drive or Mac, and the other for a microphone); and volume, balance, and bass-level controls. Panasonic provides plastic stands for stability, but the tall, thin speaker modules are still a bit wobbly and sometimes shift about when you adjust the control settings.

The amplifier is woefully underpowered. Each stereo channel gets just 3½ watts, with another 7 watts provided for the woofer. More power (if the speakers could handle it) would allow the speakers to play louder without distorting. Competitive products—from Audio-Technica, Bose, Persona Technologies, Pro-Sound, Sony, Yamaha, and others—get 10 watts per channel and more. Panasonic specifies frequency response at 40MHz to 20MHz, but the claimed loudness variation, –16dB, shows that the reproduction is far from smooth. My listening experiences bear this out.

Unfortunately, the high-technology look doesn't carry through to the sound. It's thin and slightly harsh, though noticeably more robust than sound from the smaller EAB401P system. On the EAB701Ps, voices have a nasal quality, and high-frequency reproduction, especially on cymbals, is smeared. The bass is lacking, unless you turn the bass volume control all the way up. But with the volume turned up loud, the speaker grilles and case audibly vibrate ever so slightly. The EAB701Ps don't rate well even when you compare them with a typical FM table radio.

Two CD-ROMs are bundled with the EAB701P speakers. One of the CDs has promotional material about interactive CD-ROMs, recorded in both Macintosh and PC formats; the other includes a multimedia application, Lenel MultiMedia Works, that is, unfortunately, currently available only in a Windows version.

The Last Word

A set of high-quality speakers can really enhance your multimedia experience, and some good-sounding products are available at affordable prices. Compared with other speakers in their price range, such as the AppleDesign speakers (both versions) and the MacSpeaker from Persona Technologies, these Panasonic models just don't provide great sound.

—GENE STEINBERG

Virtus WalkThrough Pro 2.0

UNDERSTANDING THE RElationship of objects to their surroundings is important to architects, interior designers, builders of theatrical sets, and even film directors blocking out movie scenes. If you need quick feedback on the spatial relationships of your designs, nothing beats Virtus WalkThrough Pro 2.0.

WalkThrough Pro not only lets you interact with finished models, it also gives you instant access to a design while you're creating it. As soon as you build an object, it appears in a rendered 3-D environment. Simply move the mouse and travel anywhere in the model scene without constraints. This exceptional level of interactivity makes WalkThrough Pro terrific for architectural massing studies and the analysis of interior spaces.

Interactive Design

Virtus WalkThrough Pro 1.0 improved on the original program by letting you add surface textures that made for more-realistic-looking, but also more-computationally-intensive, models. On standard Macs, that meant a walk-through could slow to a crawl. However, WalkThrough Pro 2.0 runs in native Power Mac mode, giving you close to real-time response even when traversing complex, textured models. Often you'll find yourself jogging.
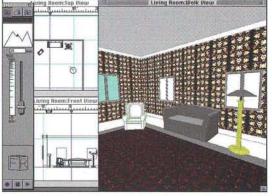
WalkThrough Pro's 3-D environment is understandable and accessible. You create and edit objects in the Design views, drawing windows (top, front, left, and so on) similar to those of 2-D drafting programs. The drawn objects automatically appear as shaded 3-D constructions in the Walk view, where you interact with the model.

Although WalkThrough Pro 2.0 lacks the object-building dexterity of general-purpose 3-D packages, it's a fairly versatile modeler that builds 3-D objects by extruding basic 2-D shapes. You manipulate basic polygons into custom shapes using control handles; and you produce more-complex 3-D constructions, such as spires and domes, by modifying the extrusion.

The resulting three-dimensional shapes are surface objects that are hollow on the inside. WalkThrough's Tumble Editor lets you rotate (tumble) the 3-D object to any orientation and carve it into sections with a slice tool that heals the cut with new surfaces. With WalkThrough Pro 2.0, you can select 3-D objects and surfaces in the Walk view. This means you can now walk to a particular object and make it active instead of having to search for it in cluttered design views—a great improvement.

You can import digitized plans into a trace layer and draw WalkThrough

Textured Interactivity WalkThrough Pro 2.0 lets you explore textured 3-D models as soon as you create them.

objects directly over it. Unlike earlier versions, Virtus WalkThrough Pro 2.0 cannot import three-dimensional DXF objects. However, that is no great loss. Because of differences in how Walk-Through and other modelers deal with 3-D objects, it is usually easier to build a WalkThrough model from a 2-D foundation than to try to clean up imported 3-D objects.

Texturing Surfaces

WalkThrough's Surface editor lets you modify the surfaces of 3-D objects. Surfaces can be transparent, translucent, or textured, so they can represent doors and windows, suggest building materials such as wood and marble, or depict interior furnishings such as paintings and carpeting. Texture mapping on multifaceted objects can look ragged along the seams, and from a distance textures can look blurry, but the ability to texture objects improves WalkThrough.

The program comes with a large assortment of textures, and you can import your own custom or commercial textures in PICT format. In addition, WalkThrough Pro 2.0 can use Quick-Time files as textures, making effects like TV sets working or trees swaying outside a window possible.

WalkThrough Pro 2.0 offers a smoother-shading option that softens the faceted edges of curved objects. It's not to be confused with the high-quality rendering offered by other programs, but rendering is not WalkThrough's purpose. Smoother shading is a nice improvement that makes for more pleasing images.

You can save individual snapshots of the Walk view in PICT, TIFF, and EPS formats and record entire walk-throughs in both PICS and QuickTime formats. For photo-realistic rendering, Walk-Through Pro lets you export models in DXF format. However, the current Power Mac version cannot write DXF, so to export models you need to install the 680X0 version and transfer the files in emulation mode.

Slight Stumbles
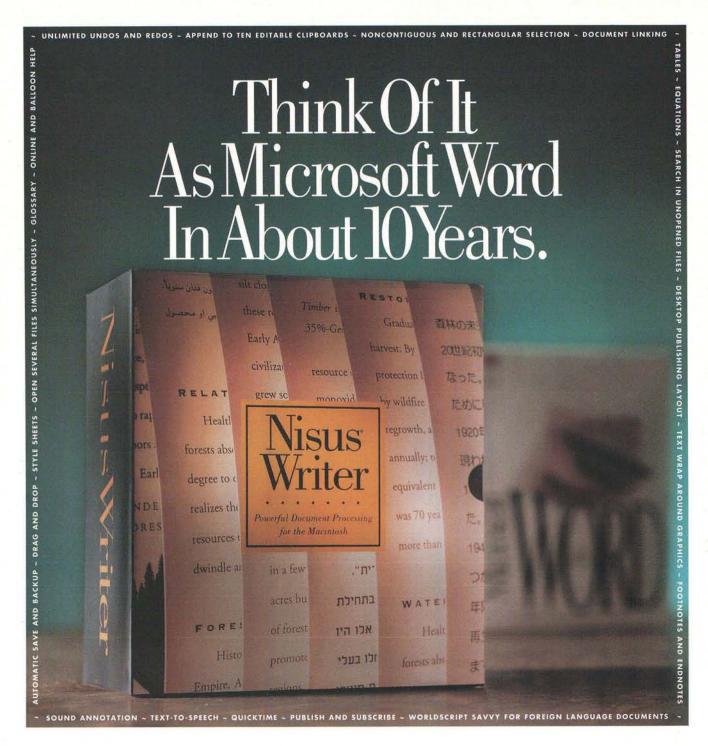
WalkThrough Pro 2.0 is not without its quirks. As with previous versions, the program sometimes quits unexpectedly, especially when walking through complex models in close-to-full-screen windows. So save your work regularly—good advice in any case.

The package comes with a good assortment of library objects with which to furnish your designs. It also includes Virtus Player, a utility program that lets you create files that can be walked through but not edited. Self-running Player files are great for distribution to clients or for stand-alone demos. In addition, WalkThrough Pro 2.0 can designate objects that behave as solids, ensuring that clients can interact with a design only within the confines of physical reality—no more walking through walls.

The Last Word

Aside from its occasional stumbles, Walk-Through Pro 2.0 is an exceptional program that lets you quickly and intuitively interact with your designs and gives clients the opportunity to visit and explore your creations before they are built. No other 3-D design program does that as well as WalkThrough Pro 2.0.

—CARLOS DOMINGO MARTINEZ
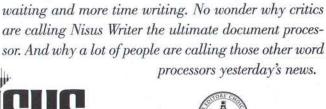
Information Managers

Now Contact 3.0

PROS: Can access contact info from menu bar; built-in mail merge features; tight integration with Now Up-to-Date. **CONS:** Can't create customized check boxes or pop-up menus for contacts. **COMPANY:** Now Software (503/274-2800). **COMPANY'S ESTIMATED PRICE:** $69; Now Up-to-Date and Now Contact bundle $99.

MW ★★★★

Now Up-to-Date 3.0

PROS: Intuitive group-scheduling features; well-designed interface; fast; good data entry shortcuts. **CONS:** Can't customize tool bar. **COMPANY:** Now Software (503/274-2800). **COMPANY'S ESTIMATED PRICE:** $69; Now Up-to-Date and Now Contact bundle $99.

MW ★★★★

THERE ARE LITERALLY DOZENS OF Mac calendar and address-book packages on the market, yet few deliver what most people are looking for—a program that is lightning fast, flexible, intuitive, and powerful enough to keep vast amounts of personal and business information organized and readily accessible. The Now Up-to-Date 3.0 and Now Contact 3.0 duo bring us a whole lot closer.

Now Up-to-Date

Now Up-to-Date is a power-packed, network calendar program. Like most calendar programs, it lets you view your appointments and to-do items in customizable monthly, weekly, and daily views. You can categorize individual calendar events as private (they appear on your own calendar only) or public (they appear on everyone's calendar). The program allows you to view any combination of private and public categories.

The Up-to-Date tool bar provides one-click access to most of the program's common commands. (The tool bar is not customizable, however.) Of course, you can hide the tool bar and still have access to all the commands via the keyboard.
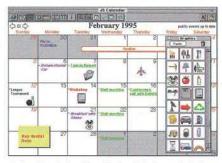
Other changes are less dramatic. A new scrolling view lets you scroll forward a day or week at a time, so you can, for example, look at the last week of March and the first week of April in the same window. Another enhancement is the Date and Time Picker, which lets you pick the appropriate date and time from a tiny pop-up calendar and time chart within the Event Info dialog box.

For networked users, version 3.0's newly added Group Scheduling feature lets you schedule meetings based on calendar information from all Up-to-Date users logged on to the network. The scheduling window's scrollable field lists all the people, rooms, and other resources available for meetings. To invite people to a meeting, you simply drag and drop their names into the Invite field, along with the name of the meeting room itself.

The program gives you two options for picking a meeting time. First, you can open the Group View, which shows the schedules of all the users invited to the meeting in a time-line chart. The timeline chart lets you quickly spot available times and then schedule the meeting. Alternatively, the Auto-Pick feature automatically scans the invitees' schedules and provides a list of all the common available times. Once you select a time, Up-to-Date notifies all invitees of the meeting time. Each user can then accept or decline the meeting or get more detailed information such as who else is attending and where it will be held.

Calendar Art Now Up-to-Date's new interface sports a tool bar and a graphics palette (on the right) that lets you add icons to monthly calendar views. The bitmapped graphics are cute, but they look terrible when resized and only those linked to appointments show up in weekly or daily views.

To use Group Scheduling and public calendars Up-to-Date's Public Event Server must be running on one of the networked Macs. (The server program is included with the Up-to-Date package.)

Now Contact

The latest versions of Now Contact and Now Up-to-Date have nearly identical interfaces, making it easy to link Up-to-Date events with Now Contact records. Now Contact provides customizable list and detail views of contact information; eight customizable fields; and a built-in word processor for creating fax documents, letters, and mail merges from within the program. Like Up-to-Date, Now Contact has a new tool bar with buttons that provide access to the most-frequently-used commands.

Now Contact's notable new features streamline data entry and contact-management tasks. The AutoType feature recognizes previously entered information and finishes typing the information for you. For example, the program will fill in the company's address for you as soon as you enter the company name. QuickFind, another new feature, allows you to locate any group of contacts by multiple category or keyword listings.

Now Contact also supports automatic contact-file synchronization between two copies of the same contact file. Like Up-to-Date, the program supports both private and public categories, so you can create contacts that are shared over the network and other contacts that appear only in your own database.

QuickContact is a system extension that allows you to search for contact information without actually launching the Now Contact program itself. You can access QuickContact via the menu bar in any application. A button in the Quick-Contact dialog box allows you to copy contact information for insertion in any other document, and you can add frequently used contact listings right in the QuickContact menu.

Dragging a contact from Now Contact onto an Up-to-Date calendar cell automatically creates a new appointment with the contact information filled in for you. You can copy contacts by dragging them from one open contact file to another; you can also drag a contact onto the Finder's desktop to instantly produce a tab-delimited text file containing all the contact information.

Now Contact lacks some features many people consider essential to the perfect contact database. The data entry helpers are fine, but customizable check boxes and pop-up lists for custom fields would be more helpful. Also, the eight customizable fields are a limitation.

The Last Word

No, we still haven't found the perfect personal information manager, but most users—especially those who need to share schedules and contacts over a network—will probably feel the Up-to-Date and Contact bundle comes closer to the ideal than any other product. Taken together, these two programs provide a set of solid, reliable tools for keeping your life and business in order.—JOSEPH SCHORR

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Two Color Printers

Apple Color StyleWriter 2400

PROS: Compact; excellent print quality; easy ink loading; inexpensive. **CONS:** Awkward network sharing; doesn't support PostScript; limited color-ink capacity; no cross-platform compatibility. **COMPANY:** Apple Computer (408/996-1010). **COMPANY'S ESTIMATED PRICE:** $525.

MW ★★★★

Phaser 140

PROS: Compact; excellent print quality; versatile networking options; works with Macs and DOS/Windows machines. **CONS:** Slightly cumbersome ink loading; provides only 17 resident fonts; requires RAM upgrade to print legal-size pages. **COMPANY:** Tektronix (503/627-7111). **LIST PRICE:** $1695.

MW ★★★

DEEP DOWN, THE APPLE COLOR StyleWriter 2400 and Tektronix Phaser 140 are similar: both use compact Canon 360-dpi ink-jet printing mechanisms. But what surrounds those cores couldn't be more different. The Color StyleWriter 2400 is an economical, QuickDraw-based machine best suited to individuals or small, Mac-only networks, while the Phaser 140 is a costlier but more capable PostScript printer that can serve a small workgroup of Macs and DOS/Windows machines.

The Latest StyleWriter

The Color StyleWriter 2400 uses a Canon BubbleJet mechanism, the same one used in Canon's BJC-4000 for DOS and Windows machines. The new mechanism uses a different ink-cartridge configuration than does Apple's Color StyleWriter Pro: the Pro provided four separate ink cartridges—one each for cyan (C), magenta (M), yellow (Y), and black (K)—the 2400 provides one K cartridge and one tricolor cartridge containing C, M, and Y inks. Because the ink chambers in the tricolor cartridge are relatively small, you will need to replace its ink supply sooner—after approximately 100 pages, versus after roughly 300 pages for the Pro (and the Phaser 140). Fortunately, you do not need to toss the entire cartridge—you

can buy a new tricolor ink tank, which snaps into the cartridge, for $21.95.

Don't need color? Yank both cartridges and replace them with Apple's High-Performance Black Ink Cartridge ($34.25). This black-only cartridge sports more ink nozzles than the smaller cartridges, a characteristic that allows the print head to spew more ink during each pass across the page, improving speed dramatically. In my tests, the Color StyleWriter 2400 equipped with the black-only cartridge printed a text document twice as fast as with the dual cartridges. In short, this is the first color ink-jet printer that I'd want to use on a regular basis for monochrome-only work.

The Color StyleWriter 2400 uses a QuickDraw-based driver. All the usual limitations of this approach apply: your Mac does all the processing of print jobs, so it slows when you print (and the printer's performance depends on your Mac's speed). Depending on the programs you use, you may also get chunky-looking graphics when printing encapsulated PostScript images or graphics created in programs such as Macromedia FreeHand and Adobe Illustrator. And of course, forget DOS/Windows compatibility.

You can share the Color StyleWriter 2400 on a network using the driver's ColorShare options, but it's your machine that bogs down when other people print. This drawback doesn't apply if you add the $99 LocalTalk interface. When you use this interface, each Mac does its own processing. On the downside, because LocalTalk is slower than the Color StyleWriter 2400's high-speed serial interface, printing times will generally be longer.

The Littlest Phaser

The fact that Tektronix's printer bears the Phaser name provides strong clues as to the Phaser 140's capabilities. Like the
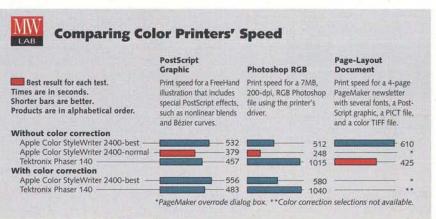
bigger, costlier, and faster members of the noble Phaser line—which use either thermal-wax or dye-sublimation printing technologies—the Phaser 140 provides built-in PostScript Level 2 and Tektronix's Finepoint image-enhancement technology, which improves the appearance of scanned images. The Phaser 140 also sports LocalTalk and parallel ports; an Ethernet port is a $295 option. All of this standard equipment explains the printer's relatively high cost. It also adds to its girth; the Phaser 140 is almost as big as a small laser printer and weighs about 14 pounds. (The 2400 weighs 8 pounds.)

Despite its bevy of built-in features, the Phaser 140 has some limitations. The printer contains just 17 resident fonts; as with any PostScript printer, you can supplement them with downloadable fonts, but doing so increases print times and network traffic. Also, the stock Phaser 140 can't print on legal-size paper (8½ by 14 inches); for that, you need to add to its 8MB of RAM. On the plus side, if you expand the printer's RAM to its 24MB maximum, you can print pages as large as 8½ by 22 inches.

Performance and Print Quality

On Macworld Lab's test track, the Phaser 140 outperformed the Color Style-*continues*

MW LAB **Comparing Color Printers' Speed**

		PostScript Graphic	Photoshop RGB	Page-Layout Document
■ Best result for each test. Times are in seconds. Shorter bars are better. Products are in alphabetical order.		Print speed for a FreeHand illustration that includes special PostScript effects, such as nonlinear blends and Bézier curves.	Print speed for a 7MB, 200-dpi, RGB Photoshop file using the printer's driver.	Print speed for a 4-page PageMaker newsletter with several fonts, a PostScript graphic, a PICT file, and a color TIFF file.
Without color correction				
Apple Color StyleWriter 2400-best		532	512	610
Apple Color StyleWriter 2400-normal		379	248	*
Tektronix Phaser 140		457	1015	425
With color correction				
Apple Color StyleWriter 2400-best		556	580	*
Tektronix Phaser 140		483	1040	**

*PageMaker overrode dialog box. **Color correction selections not available.*

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E-MAIL EMILY
TRANSFER FUNDS
BUY STOCKS
ATTEMPT TO CORNER SILVER MARKET
RENEW LIBRARY BOOKS
PULL UP PROPOSAL FROM OFFICE
PULL UP JOE'S PROPOSAL FROM OFFICE
REVISE PROPOSAL FROM OFFICE
LOOK UP SPAM IN ENCYCLOPEDIA
CHECK HOROSCOPE FOR LOVE MATCH
CALL PSYCHIC
HANG UP ON PSYCHIC
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FILE TAXES
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Writer 2400 in most tests (see "Comparing Color Printers' Speed"). (Remember that the Color StyleWriter 2400's performance depends on your Mac; we used a Centris 650 for testing.) The exceptions: the MacDraw Pro test (not shown), where the Color StyleWriter 2400's native QuickDraw gave it an edge; and the Photoshop test, where the slow transfer rates of LocalTalk worked against the Phaser 140. (The 2400 uses a fast serial connection.) When we installed the Phaser 140's optional Ethernet port, performance improved dramatically: a scanned image that took 1015 seconds to print via LocalTalk took only 609 seconds.

As for print quality, it's practically a toss-up. Both printers' drivers include color-tweaking options—the Color StyleWriter 2400 uses Apple's ColorSync technology and provides two color-matching options: Photographic or Business Graphics. The Phaser 140's Tek-Color options let you simulate the colors on-screen or those produced by a printing press. An option called Vivid Color punches up transparencies and charts.

The Phaser 140's PostScript compatibility gives it the edge when printing PostScript illustrations containing color gradients, but otherwise, both printers do an excellent job with text and graphics alike. At reading distances, scanned images look almost photographic, especially when printed on the glossy paper or back-print film that both companies sell. Overall, I give a very slight edge to the Phaser 140.

The Last Word
But it's not the Phaser 140's slightly better output quality that justifies the printer's higher price. What does is the Phaser 140's built-in PostScript, its cross-platform compatibility, and its superior networking features and options. If you're looking for a capable color printer for a small workgroup—particularly one containing both Macs and DOS/Windows machines—the Phaser 140 is a great choice. It's a sharper and less-expensive choice than its closest competitor, Hewlett-Packard's $2479 DeskJet 1200C/PS. (Note, though, that HP's machine includes 35 fonts and doesn't require a RAM upgrade to print on legal-size pages.)

If you don't need built-in PostScript, you don't care about DOS/Windows compatibility, and you don't mind a slightly awkward approach to networking, buy the Color StyleWriter 2400. You'll get gorgeous color output, much faster black-and-white printing, and a slightly smaller package. And you'll save a grand.—JIM HEID

PhotoEnhancer 1.0

EVEN A DECENT PHOTOGRAPHER CAN take bad photos using Apple's Quick-Take digital camera, which is a fun device but lacks some of the niceties of film cameras, such as focus and aperture controls. That's where PhotoEnhancer comes in. This nifty utility provides dozens of ways to improve the quality of QuickTake photos, from sharpening or softening focus to correcting over- or under-exposed shots.

PhotoEnhancer's clever interface and clear manual make the program easy to use, even for novice digital-photographers. You can open a single QuickTake image, or look at an entire folderful of images—presented graphically as slides on a light table—then open the photo you want to work on. Once the photo is displayed, you can apply picture-correction commands—lighten, darken, intensify, equalize, soften, or sharpen—to the entire image or a portion you specify by using one of the selection tools. You might select an overexposed area and darken it, for example, or soften a background to make a foreground subject stand out. The program also offers a set of brush tools for editing specific portions of a photo; the Sharpen and Smooth brushes let you sharpen or soften areas by painting over them, while the Lighten and Darken brushes let you add highlights or tone down flash reflections or other hot spots.

While you can manually apply corrections one by one with the aforementioned tools and commands, you might prefer to employ the SmartPix menu, which automatically corrects for common photographic problems such as dull colors in indoor shots or cloudy-day outdoor shots, excessive contrast in bright-daylight shots, or shadows that are too dark or too light. This feature is useful for quick fixes—especially for eliminating the sickly colors of photos taken under fluorescent light—but for optimum results, you usually have to fiddle with the manual commands.

Gimme Your Best Shot
My favorite PhotoEnhancer feature is the By Example window, which shows a grid containing nine versions of the photo you're working on, each with a different degree of correction for the problem you're trying to fix: focus, exposure, brightness/contrast, or color. Choose the picture that most closely matches what you want, and PhotoEnhancer automatically applies that image's corrections to your photo. This method is much quicker and more intuitive than choosing the commands in the Enhancement menu and waiting to see the result of each try.

Overall, PhotoEnhancer's capabilities are quite impressive. I tried it on a

PhotoEnhancer: Before and After To avoid the harsh shadows that appeared when I used the QuickTake's flash, I took a photo without the flash (left). Now the photo was too dark, and the colors were washed out and too blue. A few PhotoEnhancer operations later, I attained the much-improved image on the right.

shot I took at dusk, with the QuickTake's flash much too far from the subject. The initial photo appeared as a black rectangle with a few gray smudges. After about a dozen PhotoEnhancer operations, including lighten, brightness/contrast, focus, and color correction—mostly in the By Example window—I had a decent picture of my friend Bill, wearing a blue jacket and standing by a red truck. Amazing!

I ran into a few software glitches, including instances where the program performed operations for 15 or 20 seconds without indicating that it was processing, making me think it had perhaps frozen up (it hadn't). Also, I experienced a couple of crashes when using the Save As command—but I couldn't consistently duplicate the problem.

The Last Word
None of the flaws I came across were sufficient to stop me from recommending the program. If you want to improve the quality of your QuickTake photos, you need PhotoEnhancer.—ERFERT FENTON

ArtPad

YOUR DESK SPACE MAY NOT QUITE compete with the battle-strewn environment that greets me every morning, with a 21-inch monitor, a flatbed scanner, two removable-media drives, a PC, a Mac, a telephone, roughly 5 miles of connecting cable, and a forestful of paper all jockeying for room. But I bet you've covered nearly every inch of horizontal surface with some precious item that you can't possibly move.

Luckily, Wacom's ArtPad doesn't require much space. Measuring less than 7 by 7½ inches, it's actually smaller than the smallest mouse pad in my office. When I'm not using it, I stash the ArtPad under my mouse pad and toss the featherweight UltraPen stylus in my pencil cup. Thus the ArtPad is the first tablet to sit on my desk for more than a week.

The ArtPad comes in serial and ADB varieties, both of which I've had the pleasure to use over the past few months. The serial tablet requires a separate power supply that plugs into the back of the serial connector, thus occupying more room on your power strip. But it's also set up to work with both Macs and Windows PCs right out of the box, a real bonus for cross-platform users.

If you're strictly Mac-monogamous, the ADB version of the ArtPad offers a couple of advantages over its serial counterpart. Like all ADB devices, it gets its power directly from the ADB port, which keeps the cabling to a minimum and doesn't take up that serial port you use for your modem. The ADB connector also offers a throughput connector, so you can use both tablet and mouse from a single ADB port. (Incidentally, if your ADB port is at or over the supposed three-device maximum, it may be helpful to know that the ArtPad draws 100 milliamperes of electricity, letting you add it to your mouse-and-keyboard chain with plenty of power to spare.)

Constrained by neither cord nor battery, the UltraPen stylus borrows its weight and measurements from a conventional drawing pen, giving it a familiar feel. The pen affords 256 levels of pressure and a sampling rate of 205 reports per second, bringing it up to the same performance level as that of more-expensive tablets from Kurta and Cal-Comp. The control panel allows you to scale the tablet to your screen (or screens), specify the purpose of the UltraPen's side switch, and assign macro functions.
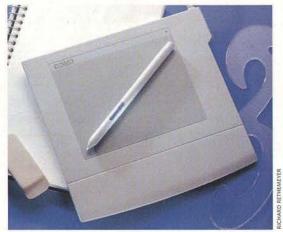
Despite its compact design and precise controls, it's unlikely the ArtPad will corner the professional drawing market. For one, the tablet lacks a transparent overlay for tracing. And unlike some CalComp pads, Wacom's doesn't offer support for pen tilt, another variety of natural-media emulation. Perhaps most important, some professionals may find the ArtPad's 3¾-by-5-inch active area too small. A 2-inch stroke, after all, translates to a long, 7-inch swipe on my monitor.

Still, the tablet offers a resolution of 2540 lines per inch, meaning that a single square inch of tablet space contains as many unique data points as do six 21-inch monitors. In other words, the tablet is sufficiently accurate for editing very-high-resolution images even in reduced-view sizes. The only factor that matters is your personal drawing style.

Furthermore, you have to love the price. Not only does the ArtPad cost less than half as much as larger tablets, but also you can purchase it bundled with Fractal Design's introductory paint program, Dabbler, for $239.

The Last Word
Suffice it to say, if you naturally draw small and you're looking for a device you can hide away one moment and readily exhume the next, the ArtPad is sheer convenience.—DEKE McCLELLAND

RICHARD RETHEMEYER

MultiClip Pro 3.1

OLDUVAI'S MULTICLIP PRO IS A REplacement for the Mac's Clipboard and Scrapbook; it's so simple and so elegant that it makes you wonder why Apple hasn't yet adopted it.

MultiClip Pro consists of an application, an extension, some auxiliary files, and a one-button installer that places everything in its proper location. The application must remain open for Multi-Clip Pro to function, while the extension lets you work directly in another application. MultiClip Pro comes with keyboard shortcuts (which you can change if they conflict with those of other programs) for copying or cutting material from your documents. The items are saved as separate editable windows, or ClipFrames, in a document window called a MultiClipboard.

You can paste items from a Multi-Clipboard at the insertion point in your document, but unlike with Apple's Clipboard, you can copy item after item into the MultiClipboard—losing none of the items in the process—and paste them in sequence, one at a time, into your document. The program also gives you the option of pasting in reverse order. Or you can use a pop-up menu to select a specific item from a MultiClipboard to place in your document. ClipFrames can consist of graphics and text objects, including QuickTime movies and publish-and-subscribe edition files.

You don't lose the contents of a MultiClipboard if you quit MultiClip Pro or restart your Mac (although you do have the option of clearing the MultiClipboard when quitting the application).

If you wish to store items, you can create collections of ClipFrames that are somewhat like Apple's Scrapbook, except that you can open more than one collection at the same time and copy items between them. A rudimentary set of graphics- and text-editing tools let you make minor changes in your ClipFrames before you use them. A search tool lets you locate ClipFrames by text content or by title.
continues

Some of MultiClip Pro's capabilities are also found in Now Scrapbook, part of Now Utilities from Now Software. But MultiClip Pro's keyboard shortcuts and ability to store more than one item in a single MultiClipboard provide a much more seamless transfer of data.

There isn't much of a downside to all this convenience and flexibility. The MultiClip Pro application takes a little over 1MB of RAM, but if your Scrapbook collections contain huge files, you might have to give the program a bigger memory partition with the Finder's Get Info command. Also, some programs use their own proprietary clipboards, meaning you may have difficulty copying material from them to a MultiClipboard. When I tried to copy objects from a PostScript drawing program (Adobe Illustrator), the

The End of Apple's Clipboard and Scrapbook? MultiClip Pro can use Apple's own Scrapbook as part of your new collection.

objects were displayed with a PostScript logo and were uneditable in MultiClip Pro. The keyboard shortcuts are almost, but not quite, transparent; there is a distinct pause, and just a flicker of your document window, when you copy or paste items to or from the MultiClipboard.

As I wrote this review, Olduvai had posted a public beta of MultiClip Pro 3.2, which adds support for System 7.5 features such as drag and drop. The beta, an updater application, is available to existing users direct from Olduvai or through its support areas on America Online, AppleLink, and CompuServe. If you are using a drag-and-drop–aware program such as WordPerfect 3.1, the update is a worthwhile addition to an already fine program.

The Last Word

MultiClip Pro is what Apple's Clipboard and Scrapbook should have been: an easy-to-use repository of data that moves between your documents without fuss or muss. Once you get used to this program you'll find it hard to do without it.
—GENE STEINBERG

FullWrite 2.01
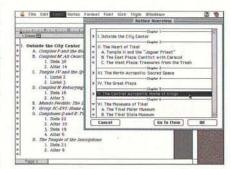
FULLWRITE 1.0 WAS A SLOW AND UN-wieldy memory hog but had a panoply of features that were the envy of every other high-end word processor. Akimbo Systems recently resuscitated FullWrite, but while the program struggled to survive, its competitors gained ground and, in many cases, bested Full-Write's former strengths.

FullWrite's modular architecture allows you to create a custom word processor containing only the needed combination of features. Modularity also makes it easy for Akimbo (and other developers) to upgrade or enhance the program. Simply by dragging FullWrite extension files into or out of a folder, you can add or remove anything.

That, ironically, is the problem. Akimbo unwisely mixed interface options with program modularization. As a result, the number of extensions is mind-boggling—more than 100 ship with the program. There is no obvious way to manage them or even figure out what's available, and customizations that should be simple are not.

New Table d'Hôte

FullWrite's tables require using special rulers that are more difficult to use than

Outline Anytime FullWrite's built-in outliner resembles the Finder's By Name window view, allowing you to expand and collapse entries. The Outline Overview window lets you navigate within and reorganize complex outlines quickly. FullWrite can use outline headings to create a table of contents.

the table editors in other word processors. There is also a convenient tool for copying character styles. A smart drag-and-drop text feature adds and deletes spaces intelligently, but you can't drag text to a different document, and the lack of an insertion-point indicator makes for some guesswork. Other new features include an equation editor.

Some features have been changed. For example, FullWrite can now insert glossary entries automatically. You can enhance sidebars with color text, backgrounds, and borders, and you can place graphics in the background as a watermark. An editable view shows two pages side by side, and in addition to indicating text changes with vertical bars, Full-Write can underline changes or display them in a different color. FullWrite uses XTND translators for file conversions, but it comes with translators only for MacWrite 5, MacWrite II, and plain text.

FullWrite 2 is still the only word processor that can wrap text around an irregularly shaped object, and the only one with a bibliography tool (albeit a simple one). The posted notes are still a pleasure to use. Although menus no longer display different commands when you press option or shift, you can still open and scroll through FullWrite's menus entirely from the keyboard.

FullWrite retains its high-end features, including multilevel table-of-contents and two-level index generation; automated cross-referencing; footnotes; endnotes; a spelling checker; a thesaurus; a basic drawing module; character and paragraph styles; mail merge (the old-fashioned, mainly manual variety); and automatic renumbering when you move numbered bullet points or items in a list. FullWrite cannot, however, generate lists of figures or tables of authorities. Its find-and-replace is comparatively weak, it can't split windows into multiple views, and its columns are limited to one format per page. FullWrite is missing tool and button bars, a grammar checker, a menu of recent files, and enlarged views. And there is no Power Mac version.

The Last Word

FullWrite 2 is now the leanest of all high-end word processors; the application is only about 800K and requires a 2MB RAM partition. FullWrite 2 is also faster and more responsive than earlier versions. If you need a high-end word processor and don't have the horsepower to run Word 6 or the need to share files with the Word/WordPerfect crew, FullWrite is definitely worth considering—especially with Akimbo's $120 competitive upgrade offer.—ROBERT C. ECKHARDT

Adobe Dimensions

ADOBE DIMENSIONS FIRST appeared in 1992. Version 1.0 was designed to be an adjunct to Adobe Illustrator—a utility that would let you take an Illustrator drawing or other image file and add 3-D effects to it. Accordingly, Dimensions 1.0 didn't let you set type within the program, and it had no drawing tools of its own—it didn't even have a Print command. It was, if you'll pardon the expression, a rather one-dimensional program.

The New Dimensions Adobe Dimensions 2.0's Map Artwork window provides text and drawing tools for creating images that you can map onto a 3-D surface. Here, the window contains a label design for a bottle.

Dimensions 2.0 is here, and is it ever an improvement. It still dovetails with Illustrator, but it also sports a well-rounded set of features that let it stand on its own. And it's now a native Power Mac application, so 3-D rendering takes place in far less time than on 680X0 Macs.

One thing that hasn't changed is Dimensions' PostScript orientation, and in this regard, Dimensions differs dramatically from 3-D–effects programs such as Pixar Typestry 2.1 (see *Reviews, Macworld*, February 1995). Typestry's end result is a bitmapped image with a fixed resolution: you can't resize it without introducing distortion. Dimensions' end product is a PostScript illustration that can take advantage of PostScript's resolution independence: you can resize a Dimensions-generated image without distorting it, and you can take full advantage of high-resolution output devices such as imagesetters and film recorders.

Another advantage of Dimensions' object-oriented approach is that you can export a Dimensions image and modify it—change its stroke and fill attributes, resize it, rotate it, and reshape it—using Illustrator or Macromedia FreeHand.

Dimensions' new features work much like their counterparts in Adobe Illustrator. The 2-D drawing tools let you create lines, curves, and text, all of which you can then turn into 3-D objects with the Extrude or Revolve commands.

The 2-D window's text tool provides character kerning but doesn't let you mix fonts, sizes, and styles within a text box.

You can rotate and resize 3-D objects and add any number of light sources. And while Dimensions 1.0 was color-blind, Dimensions 2.0 lets you create colored light sources and specify colors for object surfaces. You can also map two-dimensional artwork (such as a product label created in Illustrator) onto a 3-D surface that you've drawn in Dimensions.

One thing you can't do in Dimensions is add the kind of realistic textures—brick, stucco, shiny metal, marble—that are the hallmark of 3-D images generated in programs such as Pixar Typestry. That's because Dimensions creates 3-D images by creating PostScript blends; it can simulate degrees of shininess, but it can't make marble.

Calculating and displaying large numbers of PostScript blends isn't for the faint of processor. Fortunately, the native Power Mac version of Dimensions 2.0 is up to the challenge. In my tests, a Power Mac 7100/66 rendered images more than four times as fast as a Quadra 840AV.

Another timesaving feature, new to Dimensions 2.0, is the ability to render only a selected portion of the image. Unfortunately, Dimensions doesn't let you switch to another program while it renders in the background.

The Last Word

Dimensions 1.0 broke new ground by letting designers create 3-D effects and objects while retaining the output-quality advantages of PostScript. Dimensions 2.0 builds on that foundation by adding color support as well as the drawing and text tools (and Print command) that should always have been there. Dimensions can't create the photo-realistic renderings that bitmapped 3-D programs can, but its ability to create resolution-independent 3-D images and map two-dimensional art onto them earn it a place on a designer's hard drive.—JIM HEID

HoloGate 1.0

INTERCONNECTING E-MAIL SYSTEMS from different manufacturers is a tricky business. It's trickier still if you also want to connect the same systems to global Internet E-mail. HoloGate's mission is to simplify such connections by acting as a moderator, or gateway, between E-mail servers. In addition, HoloGate supports the collection and distribution of Internet newsgroups and the sophisticated scheduling of recurring tasks.

HoloGate can transfer E-mail between Microsoft Mail, CE Software's QuickMail, Casady & Greene's Snap-Mail, ResNova Software's NovaLink, SoftArc's FirstClass, and Unix UUCP mail servers. For all but the last, HoloGate interacts with other servers through your AppleTalk LAN; and except when interacting with Microsoft Mail, HoloGate need not run on the same machine as the foreign LAN mail servers.

Each foreign server talks to HoloGate through a gateway module that you install in your HoloGate configuration. HoloGate comes bundled with two gateway modules of your choice; additional modules cost $500 each. The basic package contains a disk with the HoloGate program and your initial gateway modules, as well as a manual covering all of the available modules.

Installing HoloGate is a complex task that isn't helped by the ponderous, poorly organized, unindexed manual. The package contains no instructions for loading HoloGate (I eventually guessed at copying the contents to my start-up drive—HoloGate would not run from a non–start-up drive), and the program disk contains no installer. Setup instructions for the various gateways are spread throughout the manual.

The lack of comprehensive error logging or messages describing problems make the configuration process difficult. HoloGate announces all errors by displaying the single word *failed* in the sta-*continues*

tus window. You must then enter a debug mode, for which the manual provides no explanation, to try to reproduce the problem and puzzle out a solution.

Once you slog through the installation and configuration process and actually get HoloGate running, it does its job. Mail sent, for example, by a QuickMail user to a user running Microsoft Mail appears within seconds in the destination user's in-box. HoloGate automatically sends messages too large for a particular destination system as an enclosed file, and automatically encodes and decodes attachment files using BINHEX or UUencoding when routing mail through an Internet gateway.

HoloGate's Internet connectivity, however, is limited to the primitive and convoluted UUCP (Unix-to-Unix CoPy) protocol, which is rarely used when more advanced protocols, such as SMTP (Simple Mail Transfer Protocol) and NNTP (Network News Transfer Protocol) are available. Unless you currently have a Unix system in-house running UUCP, you'll be hard-pressed to find an Internet provider supporting it (although IAC itself sells UUCP service and includes a one-month free trial in the kit). Finally, HoloGate doesn't support MIME (Multimedia Internet Mail Enclosures) or Apple's PowerShare gateway standard at all. Many MIME- and PowerShare-capable gateway products (for example, StarNine Technologies' StarNine) cost considerably less than HoloGate's stiff $500 entry price.

HoloGate Watches the Clock HoloGate lets you schedule batch online sessions by the day, hour, and minute, so you can set up multiple schedules as necessary for mail and news-data exchange with various host systems.

The Last Word

HoloGate comes up price-rich and feature-poor. HoloGate's two unique features—UUCP and Usenet news distribution—are the primary reasons to consider this product. If you need them, HoloGate may be for you.
—MEL BECKMAN

Expresso 1.0

Calendar and Address Book

PROS: Easy to use; nice graphics; blotter-style desktop-calendar feature. **CONS:** RAM-hungry; minimal contact features. **COMPANY:** Berkeley Systems (510/540-5535). **LIST PRICE:** $69.99.

MW ★★★

EVERYBODY AND HER GRAND-mother seems to offer software to organize your life, but so far no knockout program has claimed the prize. Berkeley Systems, undisputed champion of the screen-saver market, now steps in with Expresso, a calendar and address-book program. Can Expresso go all 15 rounds against your disorganized life? That depends on how complex your life is.

Expresso's main claim to fame is that it puts a full-screen calendar on your Mac's desktop, just like the paper blotter calendars that sit on top of real desks. A Flashback feature toggles the application on and off from an icon in the menu bar. Click on the icon once to put up a static version of your calendar as a desktop pattern; click again to make the calendar an active window.

Since you'll be looking at your calendar a lot, you'll want to like what you see. Berkeley Systems offers 20 calendar designs in the basic Expresso package, with more in the works. (In November the company brought out a version with six *Star Trek* "looks.") Each look has its own colors, calendar design, and TrueType font, and some include basic animations that can run in the background at idle times. Practically speaking, many of the designs are difficult to read day in and day out; I ended up switching to the most basic pattern.
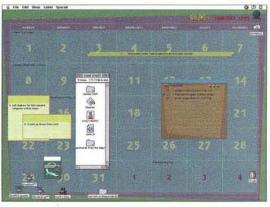
The easy-to-use calendar has a straightforward interface and simple text entry. It provides banners; a basic alarm; support for repeating events; a to-do list; and daily, weekly, and monthly views. Information from Expresso prints out nicely, in daily, weekly, and monthly layouts based on the current look. You can scale layouts to fit most Day Runner–style organizers. Expresso lets you assign priorities to to-do items, and you can archive your lists for later reference.

Expresso's weakest point is its address book. The program uses a rotary-card-file metaphor for displaying contact data.

The cards include the essential fields, but you can't customize fields or categories or other types of information you might want to show. The space on the card limits the amount of information you can enter, so contacts having multiple addresses require multiple cards.

Furthermore, to be useful, contact data should be easily and quickly accessible from the calendar. Expresso claims to support drag-and-drop linking between the address book and the calendar and to-do list, but links between the two components are weak. For instance, if you drag "12:30 lunch date with Sarah" from the calendar to your address book, that exact text drops into a single address-book entry field, adding a rather garbled entry to your contact list. Expresso won't cross-reference Sarah with any of the Sarahs
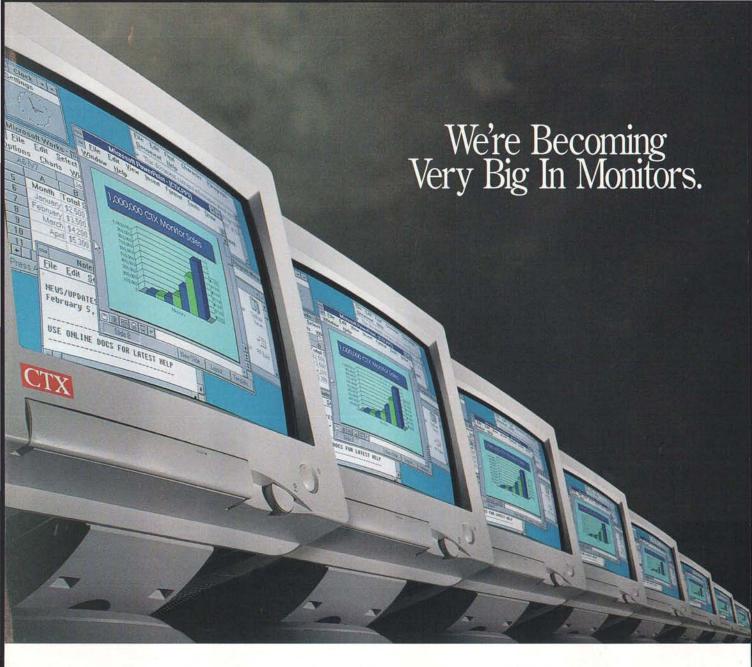
Everything but the Coffee Stains A Flashback feature takes a snapshot of all active Expresso windows and puts it on screen as a desktop pattern, allowing you to capture your to-do list, sticky notes, and calendar for a quick reminder of how busy you are.

in your address book so you can remember which one you're supposed to see and check her phone number. Expresso can link only one to-do item or person to a calendar entry, making it useful for only the most rudimentary tasks.

Also, the full-screen calendar view poses a problem: clicking on the calendar window sends all the other Expresso windows behind it, making it impossible to drag information from the calendar to your address book or to-do list.

The Last Word

I can't recommend Expresso to anyone who needs a full-featured information manager. Furthermore, 2MB of RAM is a lot to demand for a simple application that most users will want to run in the background. But Berkeley Systems' just-the-basics approach might be just fine for people who don't need the feature set of other calendar programs and can get by with a bare-bones contact manager—especially if they go for Expresso's graphics.—MATTHEW HAWN

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Circle 38 on reader service card

Overture 1.02

PITY THE POOR DESIGNERS OF MUSIC-notation software. They have to contend with Finale, Coda's 500-pound elephant that dominates the music-notation software business much as Adobe's Photoshop lords it over image manipulation.

Pity also the user, whose needs may fall short of Finale's incredibly complete assortment of tools, famously long learn-

Tool Time Overture's tool palettes tear off from the menu bar and can be positioned anywhere.

ing curve, and $749 list price. The need for a cheaper, easier-to-use program has given rise to several worthy products, including Passport's Encore, Jump Software's ConcertWare, and Finale's younger sibling, Finale Allegro.

Noted for its sequencing software, Opcode Systems enters the midrange fray with Overture, an easy-to-learn notation program with a friendly interface. For those who won't use some of Finale's more esoteric features (harp tablature and four-staff Gregorian chant notation come to mind), Overture will fill a real need. Overture may be especially attractive to educators and users of Opcode's Vision series of sequencers.

Overture is a compositional environment, a software analog of the composer's, orchestrator's, and/or copyist's desktops. And, like the notation programs mentioned above, its strength is the seamless progression from idea to full score to individual musicians' parts.

In Overture you notate and edit using palettes that let you assign note duration, dynamics, accidentals, and other symbols. You tear these palettes off the menu bar and position them anywhere on the screen—a nice feature, because you aren't required to change modes to access those functions as you must do in Finale. Once opened, the palettes remain open instead of vanishing with each tool change. Keyboard shortcuts are well thought out and easy to remember.

Entering and Editing Notes

The easiest way to enter notes is to play them on your synthesizer in real time, and here Overture excels. Overture captures the MIDI data and converts it to notation. Step entry is equally simple: play a note or chord on your synthesizer, then assign a duration—whole note through thirty-second note—through a button on a palette or with a ⌘-*key* (whole notes use the number 1, eighth notes use 8, but thirty-second notes use 5). Finally, Overture allows you to enter notes and chords individually by using the mouse to select a duration, then clicking on the staff to assign the pitch. Most users will find this method too slow.

Overture lets you edit MIDI data using the piano roll/strip chart format familiar to sequencer users—a real boon for those who are making the transition to conventional notation. You can adjust key velocity and pitch bend visually, by using Overture's strip chart. Overture handles quantization well, correcting time errors with half-note–to–sixty-fourth-note sensitivity.

Although Overture imports most MIDI files with ease, I encountered system crashes when importing large files. Assigning more memory seemed to solve the problem, but the Mac's serial port still acted up occasionally.

Ease of input and editing are just half the battle, though; output is the other critical factor. Using the included music font, Overture prints out concert or transposed scores very well. It's easy to extract and output parts for individual musicians.

Overture requires Opcode's OMS, an included MIDI manager that works with or without Apple's MIDI manager. Unfortunately, Opcode has copy-protected Overture, limiting its installations and making it run on a drive named at installation time.

The Last Word

How do you choose a notation product in this price range? Think of the most remote musical frontier upon which you're likely to tread, and then determine which product fills the bill. Estimate your learning time, and tailor your purchase to your budget. Overture, showing real polish and promise, is sure to be a contender. —RICHARD FENNO

Inspiration 4.1
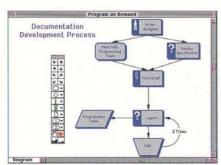
INSPIRATION CLAIMS TO BE a visual way to quickly develop and communicate ideas, and it is. Inspiration lets you easily draw a diagram to represent an idea, process, meeting, or organization, and with one keystroke turn that diagram into a hierarchical outline. Or you can start with an outline, and Inspiration can turn it into a diagram. Whichever order you prefer, Inspiration allows you to move between words and diagrams to show the relationships between ideas.

Picture This

Inspiration's diagram view lets you select symbols, place them, type your ideas inside of them, and connect related symbols with links. You can add annotated notes to symbols; add text to the links between symbols; or use the simple drawing tools to add lines, boxes, and shapes to the diagram.

Inspiration includes a resizable grid for aligning symbols, automatic arrangement and alignment tools, and rulers for precise measurement (though you can't change the increments on the rulers). The beauty of this system is its flexibility. You can turn off the grid and place symbols wherever you like, or use the Rapid Fire mode, which creates a new symbol every *continues*

Diagram View By placing and linking symbols in Inspiration's diagram view, you can visualize the steps in a process, the structure of an organization, or the facets of a complex idea.

time you press the enter key, to brainstorm and let your ideas flow freely without stopping to select and place symbols.

Inspiration 4.1 offers over 450 new symbols (arranged in 15 fully editable libraries), including boxes, signs, fancy borders, and computer symbols. You can create your own symbols in a paint or draw program or import PICT2 graphics. Version 4.1 also offers improved keyboard control over placing symbols on the diagram.

True, you could use a draw program to create circles, boxes, and connecting arrows, but Inspiration does more than draw shapes—it understands the relationships you create between symbols. You can create subdocuments, called children, which are full-featured diagrams that provide further detail about a topic. When you rearrange symbols they stay connected by their links. And version 4.1 allows you to easily insert and delete symbols while maintaining the link structure. You can even create a hidden link between symbols, useful when you don't want to display a physical link between the symbols in your diagram but do want to establish a hierarchical relationship in the outline view.

Outlining Power

The outline view lets you organize your text in a hierarchy of topics and subtopics. Outlines can have up to 99 levels of subtopics. You can expand and collapse the topics to focus on whatever level needs your attention, without getting overwhelmed by detail. Many word processors and presentation programs offer outlining capabilities, and some are more flexible for large-scale documents, but none offer Inspiration's power. Inspiration lets you write an outline, transform it into a diagram, and add or delete topics and subtopics in either the outline or diagram view.

Version 4.1 adds RTF import and improved RTF export capabilities, so you can import or export outlines. It also adds Houghton-Mifflin's 200,000-word spelling checker (compared with version 4.0's 70,000 words) and enhanced keyboard control over outlining and text editing.

The Last Word

Inspiration 4.1 adds improved keyboard control, import and export capability, symbol flexibility, and cross-platform support to an already innovative and effective program. Whether you think better in words or pictures, switching between the two views adds a level of insight to almost any project, making Inspiration a valuable tool for planners and dreamers alike.—LIZA WEIMAN

EndNote Plus 2.0

Bibliography and Citation Manager

PROS: Enhanced search and change functions; term-list feature aids data entry. **CONS:** Needs more data entry shortcuts; no horizontal scroll or word wrap in library window. **COMPANY:** Niles & Associates (510/649-8176). **LIST PRICE:** $299.

MW ★★★★

ENDNOTE PLUS 2.0 IS THE LATEST release of Niles & Associates' indispensable tool for harried academics and others who have to keep track of references and bibliographies. You get two versions of the software: a plug-in module that works with Microsoft Word 5.0 and 5.1, and a stand-alone application for use with WordPerfect, WriteNow, MacWrite, FrameMaker, and Nisus. (EndNote does not yet support Word 6.0; registered users will receive a 6.0-compatible upgrade at no charge when it becomes available.)
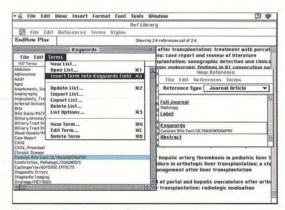
EndNote serves a dual purpose: as a database program it manages collections of reference works, and as a bibliography builder it formats papers that contain reference citations. To use EndNote, you create a reference file, or library, and then plug the required references into your text. EndNote scans your document, inserting properly formatted citations and building a bibliography as it goes. The software ships with predefined formats for more than 200 scholarly publications. If your favorite journals aren't among these (mine weren't), you can create new styles that specify exactly how your citations and bibliography entries should appear.

In previous versions, EndNote's database-management functions were not as comprehensive as they might have been, so I was pleased to see that they've been enhanced considerably. The Find function now lets you search for empty fields and for fields that fall within a specified range of values (say, 1988 through 1995). Version 2.0 also gives you more control over the way the program displays reference lists. Two new commands allow you to include or exclude selected items from a list, and you can now choose the font and size of the display type. (Alas, my previous complaints about the lack of a horizontal scroll bar or an automatic word-

wrap feature in the Library List window still haven't been addressed.)

EndNote has two other welcome additions. The new Change Text command allows you to replace one text string with another throughout a database, and the Change Field command lets you replace a field, clear a field, or append text to a field, no matter what its contents. Version 2.0 also sports beefed-up import and export capabilities. For instance, you can now merge two databases by importing one library into another, and a new option weeds out duplicate references when you're importing. (For $99, you can buy a separate product called EndLink that imports references from online services and CD-ROMs.)

Another new feature lets you create lists of terms you can refer to when adding new references to a library. Term lists can contain author names, journal titles, keywords, or any items whose usage you want to keep consistent. You can link a term list to a specific field, so that the proper list appears when you enter data. Unfortunately, you have to open a term list to
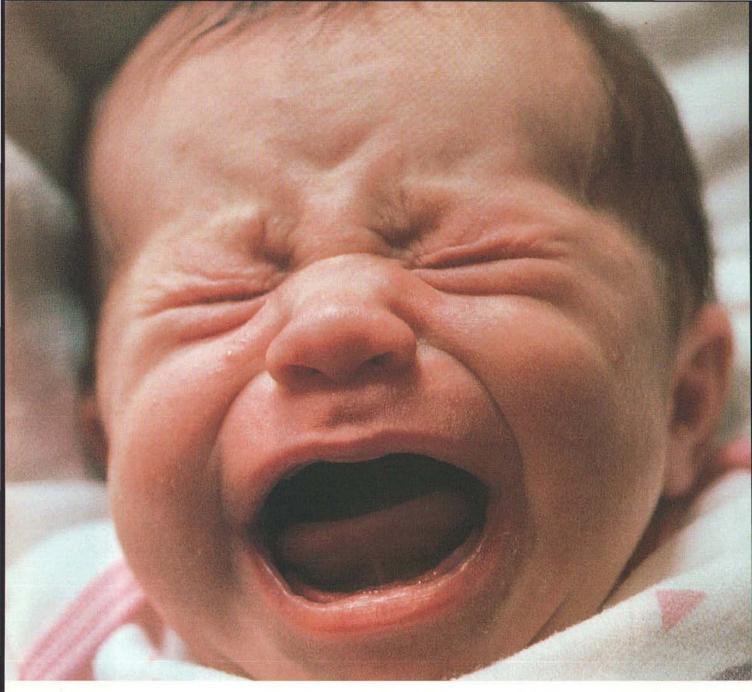
Reference Terms Term lists can save you keystrokes and help prevent errors when you're entering data into an EndNote library.

use it; I'd like to see an option that automatically inserts a term as soon as your typed entry matches an item from the list. Automatic text formatting—word capitalization, for example—would be another handy feature.

Despite its power, EndNote Plus 2.0 remains surprisingly easy to learn and use. The revamped manual runs over 400 pages, but it's thoughtfully organized and includes a wealth of helpful tips. Niles & Associates offers technical advice by phone, and it also maintains a support forum on America Online.

The Last Word

EndNote Plus 2.0 is an example of an excellent product that's grown more powerful over the years. If you have to work with citations and bibliographies, I recommend it highly.—FRANKLIN N. TESSLER

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Circle 68 on reader service card

Read-It O.C.R. Pro 5.0

GENERAL-PURPOSE, ACCURATE OPTI-cal character recognition of printed text remains—I am sorry to report after following the OCR field for almost 15 years—something of a software challenge. Read-It O.C.R. Pro 5.0, for example, features an excellent Macintosh interface, includes the only drag-and-drop OCR facility on the market, reads several specific kinds of text at nearly 100 percent accuracy, and correctly interprets bold and italic within a given font family. Yet, on plain-vanilla 10-point Times Roman printed at 2750 dpi, and on other more difficult image files in the standard *Macworld* test suite, Read-It is capable of producing text that contains long strings of unusable hash.
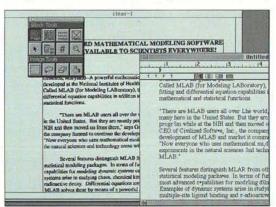
Some aspects of the program are baffling. Given that Read-It processes the scanned text through a spelling checker, I simply don't understand how it (or any other OCR program, for that matter) can produce files containing misreadings of many of the 20 most-common words in English (see "all over Lhe world"). No program should offer, as Read-It O.C.R. did, *th3t* instead of *that*, or *theg* for *they*. While I don't necessarily expect any optical character recognition program to get *chiropodist*, based on English-language probabilistic models there's not much excuse for Read-It to see *in* as *im* throughout a page. The situation is enough to remind one of the low comedy attending the introduction of the first Newton software.

There are other anomalies here as well. Most OCR programs offer disastrously worse reading performance on fuzzy printed-out faxes than on cleanly printed text; in contrast, Read-It O.C.R.'s accuracy is in the low 90 percent range on clean text and bad faxes alike. (Competing programs produce accuracies on clean text in the high 90 percent range.)

The exception to this rule seems to be that Read-It reads text in Courier and a whole family of typewriter-like fonts with strong serifs quite accurately, with no errors in three or four pages. This suggests to me that the recognition algorithms don't have enough statistical feature data to work with on, for example, Geneva or Helvetica. Perhaps this is also why Read-It is decidedly skew-sensitive—if you line up a sample in a flatbed scanner and the edge is off by a few degrees, Read-It will often have severe reading problems.

Nonetheless, this program has attractive features, especially if you're scanning typed material on its favorite scanners (Apple and Hewlett-Packard). It converts image files to text when you simply drag the image files over the Read A.S.A.P. icon, it's easy to set up for batch mode, it

all over Lhe world Why a modern OCR program would report such words as *Lhe* (read here by Olduvai's Read-It O.C.R. Pro 5.0) or *tne* or *tlne* is one of the last remaining mysteries in probabilistic analysis of text.

flows text directly into word processor files, it's unfazed by font and style changes in a document, and in all test documents it correctly zoned the text blocks. Its word-verification pop-up is nicely implemented, too—the problem is that it pops up all too often. The framework of an outstanding OCR program is here, but Olduvai has to convince the program that under no circumstances should it offer *thinp* as a possible reading of any text in English, no matter what.

The Last Word

Read-It O.C.R. 5.0 has a nice assortment of convenience features, but its recognition engine, although improved over earlier versions, isn't up to the standards set by Xerox's TextBridge or Caere's Omni-Page. It's not a first choice unless you simply need to process piles of very clear Courier text.—CHARLES SEITER

Special Delivery

SPECIAL DELIVERY 2.0 IS A MULTI-media authoring tool that falls between industrial-strength authoring programs, like Macromedia's Director, and presentation-graphics programs like Adobe's Persuasion. Special Delivery can't create bullet charts as easily as Persuasion does, and it's not as flexible or powerful as Director. It's for use with documents more complex than a slide show but less interactive than, say, Myst.

At first glance, Special Delivery's slide-show metaphor is similar to that of other presentation programs. The Layout view shows each slide as it will appear to the user. Text, graphics, video clips, and buttons are stored in geometric regions called portals. The Tools palette includes a text tool and simple drawing tools, although it isn't a full-featured graphics editor. Special Delivery can import a variety of media types, and it comes with a library of clip media.

The first slide is a map, which is similar to the slide-sorter view in other presentation programs. But because Special Delivery aims to transcend the linear slide-show model, rearranging slides is more difficult than in other programs.

The slide-show metaphor breaks down when you switch to Button View, where you add interactivity. In Button View, portals are visible only as colored outlines. Labeled arrows link portals to show interactivity. Button View is like looking under the playfield of a pinball machine; you see the circuitry that causes things to happen. For a simple interactive presentation, Button View can be enlightening. For a complex hypermedia document with lots of linked objects and complicated logic, the maze of arrows is intimidating. The developers tried to make this view more intuitive by having the program automatically create labels identifying what each arrow does. Unfortunately, labels like "1. BdHM.5 Show" don't make complex structures simple.

Creating an interactive link is easy for buttons that perform common operations: draw a link and choose the menu *continues*

item that tells the arrow what to do. The Button menu offers more than 50 commands, including navigation controls (Next Slide, Open Application), data controls (Play, Scroll), portal controls (Show, Condition Enable), and presentation controls (Hide Cursor, Increase Volume).

You can customize buttons via dialog boxes. Several additions to version 2 make buttons more versatile. For example, you can now program a button to respond only after another button has been clicked, or after a time delay, or to perform a different function the second or third time it's clicked.

How effective is Special Delivery's unusual multiview interface in real-world authoring? As a test, students in my interactive multimedia class at Oregon State University built a prototype for an interactive tutorial. The students (Mark Dinsmore, Hector Hernandez, and Brian Maillard) agreed that Special Delivery was easy to learn and use once they adjusted to its interface. But they ran up against limitations in the program when they tried to add features like an intelligent backtracking button. The students also reported occasional inconsistent responses and sporadic system crashes. While I wasn't able to replicate these in smaller test projects, I did find more glitches than I'd expect in version 2 of a product.

The Inner Workings In Button View, arrows show how buttons control the video clip (left) and make the picture and text blocks appear.

The Last Word

For large projects that include hypertext, frequent backtracking, or anything else out of the ordinary, Special Delivery isn't your best choice. Still, it might save hours or days of training for users who need to create simple, professional-looking interactive presentations combining text, graphics, video, and sound.

If you're hesitant to spend $399, the company's $24.95 (plus $4 S/H) Interactive Multimedia CD-ROM contains a trial version of the program, a thorough set of interactive lessons for learning it, and other materials. This CD should help you decide whether Special Delivery is worth signing for.—GEORGE BEEKMAN

mPower 2.0

Multimedia Authoring Program

PROS: Provides an easy-to-learn approach to media integration; supports a wide range of file formats and media sources. **CONS:** Awkward, button-intensive interface; limited transitional and animated effects. **COMPANY:** Multimedia Design Corporation (704/523-9493). **LIST PRICE:** $295.

MW ★★

MPOWER IS AN ENTRY-LEVEL multimedia authoring program that sets out to make the creation of interactive presentations as simple as possible. Toward that end, the program dispenses with the usual array of menus, submenus, time lines, and dialog boxes that you find in most authoring tools. Instead, mPower offers a push-button interface that is similar to a bank ATM.

The program's slick-looking main interface consists of a small window where you view your presentation in progress and a column of 3-D–style buttons with functions that change depending on your location in the program. This approach makes mPower easy to learn and understand; you accomplish virtually every task involved with assembling a presentation—creating slides; selecting backgrounds; adding text, graphics, video, and sound; applying transitional effects—by clicking on the clearly labeled buttons on screen. Unfortunately, clicking on button after button also makes authoring cumbersome and time-consuming.

To illustrate: Suppose you want to create a new slide containing a text object. First you click on the Add New Slide button, then the Text button, then the Add New Text Button. Now you can actually type the text on the slide, but to change the font you must click on the Font button. This produces a dialog box containing eight standard fonts; if you want to use some other font, you must then click on the Other Font button to get a list of all installed fonts. Setting other text characteristics—color, style, size, and so on—involves more buttons. When you've formatted the text, you have to click on the Done with Text button before you can move on.

All this button clicking makes the interface a bit claustrophobic. The feeling is intensified by the fact that you're forced to view your slides in the tiny Object Window at a reduced size. True, you can preview slides at full size, but in full-size view, you have no access to any

of the editing buttons. The program provides no other viewing options; you can't zoom in or out when editing a slide.

While mPower may lack the hidden menus, submenus, and dialog boxes that complicate other programs, it also lacks a real arsenal of authoring tools. Drawing tools are minimal and clumsy. Likewise, slide-to-slide transitional effects lack variety. You can make objects enter and exit on cue—but only along eight predefined, uneditable paths. You also can make objects fade in or out, but I found that fade transitions produce jerky, halting results on a Quadra 630.

One of mPower's strengths is the broad range of media it allows you to integrate into presentations. You can import graphics in PICT, PCX, Photo CD, and EPS formats; audio directly from compact discs or in AIFF and snd formats; and QuickTime movies and other video digitized from a VCR or camcorder. The

Button Up With mPower's ATM-like interface, every command is a button-click away. The current slide in the presentation is displayed in the window on the left, and access to editing tools is provided through the column of buttons on the right.

program's A/V controller supports a variety of Sony and Pioneer laser-disc players, too, along with any serially controllable analog media sources, such as high-end VCRs.

The program also offers some good tools for adding interactivity to a presentation. You can set up buttons on slides that let viewers control the flow of a presentation, play sounds, show QuickTime movies, move the viewer to any other slide in the presentation, or launch another application.

The Last Word

Despite a handful of sophisticated multimedia features, mPower is too limited to be a compelling authoring tool. And while its push-button interface is easy to grasp, it's far too cumbersome. It simply takes too long to navigate the program. In the end there are programs, such as Gold Disk's Astound and Macromedia's Action, that provide a far better entry-level approach to multimedia.—JOSEPH SCHORR

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RescueTxt 1.0

THE WORST HAS HAPPENED. You've accidentally trashed a valuable file that contains important information you need. Or you've forgotten which file contains the text you need. Abbott Systems' RescueTxt is designed to help you solve both problems.

RescueTxt searches all of your hard drives for the presence of any text string. Unlike other utilities that search for text, RescueTxt reads the disk directly, block by block—so it can actually seek out text in files you've already deleted, provided nothing has written over the deleted file. I had RescueTxt search for text in a number of documents, some recently deleted, and it was consistently successful in finding the correct search strings.
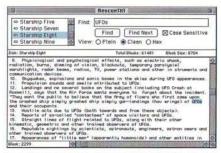
Unfortunately, even when you locate the text in a file that isn't deleted, RescueTxt doesn't tell you the file's name, so you cannot simply open it. Your only option is to cut and paste the text into a new document. Thus you lose any format information contained in the original file.

RescueTxt is simple to use. You launch the application (which is native for the Power Macintosh and compatible with 680X0 Macs), enter your search string, choose whether the search string is case sensitive, then select the drive you want to search, and click on the Find button. If the item that matches your search string isn't the one you want, you click on the Find Again button to continue the search where it left off. The program is quite speedy. But its modal (nonmovable) dialog box prevents you from doing anything else on your Mac while the search is progressing.

If you want to search for text in a document, other programs display the name of the file that contains the text-string match and (in some cases) launch the file in the program that created it. Some examples are Now Software's Now SuperBoomerang (part of the Now Utilities collection), Gopher (which comes with PrairieSoft's Disk-Top), and even the new System 7.5 Find File application. There are others, including some shareware. But these programs will not locate text in a file you've already deleted. For that, you can use Central Point Software's MacTools Pro and Norton Utilities (the latter will also search for text strings in files not deleted).

None of these programs, however, perform quite as speedily as RescueTxt.

How Do I Find Thee? Use RescueTxt to locate missing text on your hard drive, even if you've already trashed the file.

The Last Word Yes, RescueTxt is a one-trick pony. But if you want decent performance and the ability to locate text in even a deleted file, RescueTxt is worth consideration, if only as an additional tool in your utility arsenal. RescueTxt makes a trade-off between speed and retaining the file name: the lack of file names is frustrating, but the speed is ultimately worth it.
—GENE STEINBERG

MLab

THE MATH PROGRAM MLAB IS short on Mac amenities but is quite powerful for a large range of science applications. This includes any activities in which the expected behavior model of the underlying physical, chemical, or biological system is an ordinary differential equation or system of equations. That's a big range. In fact, MLab is more than a match for Prescience's Theorist, a middleweight symbolic-math package; moreover, in its own domain MLab shows several advantages over Wolfram Research's Mathematica.
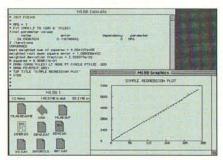
MLab, which was developed at the National Institutes of Health, is not a general-purpose math program. It's essentially a programming language, drawing on constructs from Pascal, FORTRAN, and BASIC, that implements a large assortment of commands for fitting experimental data to dynamical (usually differential-equation) models. MLab also covers statistics (descriptive, cluster-analysis, and survival-analysis), fast-matrix algebra, and an assortment of graphs oriented toward presentation in scientific journals.

By Mac software-interface standards, MLab is pretty primitive—its Unix and DOS origins make it a good choice for researchers familiar with text-based command-line programming. At start-up MLab displays a blank Console window with no horizontal-scrolling or sizing capabilities. The File menu doesn't even include old favorite commands such as Open. The program requires a 68020 or higher processor and hardware math coprocessor (the on-CPU hardware math in the Quadra 650, 800, and 950 works), and it doesn't yet come in a Power Mac version. However, it can function in less than 2MB of free RAM, making it the least-demanding high-powered science application for the Mac.

The payoff in MLab, compared with other scientific software, lies in the large number of carefully explained, easy-to-program examples included in its truly superior documentation. The tutorials on enzyme kinetics, multicompartmental pharmacological models, pulsed magnetic-resonance spectroscopy, nonlinear oscillators, and nearly 30 other scientific topics are clear and full of practical examples. In principle, you could do this sort of modeling in Mathematica or many other packages with well-designed floating-point numerics. The difference is that MLab tells you explicitly how to do it, with instructions written by scientists for scientists.

The Last Word MLab lets you do fast computation on numerically complex real-world problems, using only an ancient Mac II or higher. You must be willing to write short (usually single-page) programs, but MLab will reward the professional researcher with its mathematical-modeling capabilities.—CHARLES SEITER

Plain in the Plane Although the program supports contour and surface 3-D plots, the typical MLab plot is simply a 2-D publication-ready black-and-white line graphic like this regression sample.
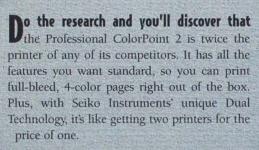
Before you buy a color printer, you'd better double-check your facts.

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NetWorks 3.0.4

IF YOU ARE A NETWORK MANAGER who dreams of becoming omniscient, NetWorks is for you. This easy-to-use software continually polls devices—CPUs, printers, routers, hubs—over AppleTalk, DECnet, IPX, and Unix networks, checking them for signs of life. It can also monitor network zones and services running on file servers (such as an E-mail system). It offers a multitude of configuration and reporting options and runs neatly in the background of the net manager's Mac.

A concise device list reports back on the devices you choose to have tested, indicating whether a device is down, up, on hold, or waiting to be tested. This list also provides detailed device information, such as traffic statistics from a router.

Devices equipped with SNMP permit enhanced reporting such as network-traffic speed (in bits per second) and system performance. NetWorks recognizes SNMP agents included with many hardware devices, such as routers and network hubs. Caravelle's own SNMP responder is for use on CPUs. This is useful for file servers and Macs running critical network services, such as remote access. A control panel lets you check hard drive statistics of any Mac, including available disk space.

Send Up a Flare When something goes wrong on the network, say, a server goes down or is inexplicably slow, NetWorks can notify you via on-screen messages, E-mail, messages sent over a pager or forwarded to an online service, or spoken via MacinTalk (not compatible with System 7). Alerts are customizable and can include the device name, the device type, the device's network location (zone name), and even network-node numbers and Internet addresses.

When you set up NetWorks, filters help you select particular zones or specific devices, such as printers or routers. I installed NetWorks on my Quadra 650 and, from a list of available devices on my company network, selected 25 devices that are critical to the smooth operation of the network. In about 35 seconds NetWorks monitored all 25 devices and reported back on

Virtual Network Viewing NetWorks' Device List shows you at a glance any trouble on your net.

their status. After I intentionally shut down a printer, in seconds NetWorks reported the failure to me via desktop notification (E-mail and pager options take from a few seconds to a few minutes longer, depending on your E-mail system and paging network). I also verified disk-capacity data, and I shut down several systems and E-mail services on monitored systems. NetWorks was speedy and accurate.

The Last Word If the network you maintain is small—say, ten or fewer critical devices, all located within your building—NetWorks is not a cost-effective choice. But for networks that sprawl across several buildings or even several states, it's a net manager's indispensable tool.—MATT CLARK

RemotePoint

CORDED MICE AND TRACKBALLS ARE fine for desktop pointing and clicking, but they fall short for doing stand-up presentations, when cables just get in the way. The RemotePoint, a new infrared pointing device from InterLink Electronics, offers a novel solution for Macintosh users who don't want to be tied down.

Sporting a contoured look that resembles a *Star Trek* hand phaser, the RemotePoint is designed to suit either right- or left-handed users. When you grip the RemotePoint, your index finger rests on a forward-facing button that is functionally identical to a standard mouse button. (Another button on the upper surface serves the same purpose.) A disk on top of the RemotePoint controls the cursor. The cursor's movement corresponds to the area of

the disk you've pressed; press harder and the cursor moves faster.

The RemotePoint communicates with the Mac via a compact infrared sensor that plugs into the Mac's ADB port. Although the manual recommends placing the sensor anywhere that guarantees an unbroken line of sight, I found the RemotePoint more forgiving than some other infrared devices I've tried; cursor response remained smooth even with the RemotePoint aimed off to one side of the sensor. It works at distances of up to 40 feet.

Two AAA batteries (included) provide power for the RemotePoint; according to InterLink, the batteries should last about one year. Inserting the batteries turned out to be the only sore spot—the two tabs that hold down the battery-compartment cover bend easily, making it impossible to snap the cover into place until you pry them back into position.

If you've already grown accustomed to a mouse or to a trackball, becoming proficient with the RemotePoint takes some practice. Until you learn to control the degree of pressure you apply to the disk, it's easy to overshoot your target on the monitor. Even with experience, though, some operations remain more cumbersome than they are using a desktop pointing device. For instance, it's harder to draw curves with the RemotePoint than with a standard

mouse, largely because your thumb isn't designed for circular movements. Dragging is also more awkward with the Remote-Point, because it's hard to press the button and manipulate the disk at the same time. InterLink should consider adding a dedicated click-lock button, or at least let you configure one button to lock using control-panel software.

The Last Word Although it's not my first choice for desktop work, the RemotePoint is an elegant workaround for people who don't want to (or can't) be tethered to their Macs.—FRANKLIN N. TESSLER

MMS557

AUDIO-TECHNICA'S NEW MULTI-media loudspeaker system demonstrates that good things can come in small packages and at modest prices. The MMS557 active two-way multimedia speaker system consists of two solidly built units, each 9 inches high and 5½ inches wide. The right speaker, which contains the amplifier, has volume, bass, and treble controls and an on/off switch. Audio-Technica provides black metal desktop stands to raise the speakers a couple of inches. The package is rounded out by speaker and input cables and an external power supply that plugs into an AC wall jack.

The Audio-Technica MMS557 employs a basically straightforward design, not unlike many conventional speakers. The tweeters are diminutive, just ¾ inch in diameter, and they reproduce the midrange and high frequencies. A 4-inch bass reflex woofer (using a hollow tube or port to enhance bass response) handles the low frequencies. The internal stereo amplifier is rated at 20 watts total power. Audio-Technica doesn't say what rating method it uses (the audio industry uses several), but the rating means that the system produces a reasonable amount of undistorted sound, probably as much as anyone needs outside of a regular stereo system. Frequency response is rated at 80Hz to 20,000Hz, but no response variation is specified.

The proof is in the listening, though, and there the Audio-Technica speakers acquit themselves well. They produce midrange and high frequencies with a clear, well-balanced sound one doesn't expect in speakers in this price range. There's even a decent amount of bass to add heft to the sounds of games such as Myst and your favorite music CDs.

The speakers don't break the laws of physics, however; if you turn up the volume too far, the sound gets a trifle harsh, and turning up the bass tone too high makes the low frequencies a bit muddy. At normal volume levels the speakers can't quite plumb the lowest depths of the frequency spectrum, a deficiency to be expected. But used within a comfortable listening range, there is little to fault in these speakers' sound.

My other quibbles are few. The manual doesn't tell you which RCA phone plug to hook to which channel on the speaker (the convention is red for the right channel, white for the left). And there isn't a separate input jack for the audio output from an external CD player, forcing you to scurry to the nearest Radio Shack for adapter cables. I could also wish for a subwoofer to provide more oomph in the bass region.

The Last Word Among a huge selection of similarly performing speaker systems, Audio-Technica's MMS557 stands out as a best buy in its class. The speakers look good, but more important, they sound good, and are a worthwhile addition to any multimedia setup.—GENE STEINBERG

PaperPower 1.0
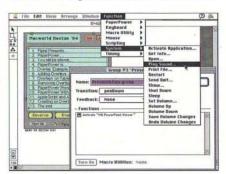
IF YOU USE A GRAPHICS TABLET, PAPER-Power lets you create customized paper overlays that reduce your reliance on the keyboard and mouse and make your tablet a control center for presentations. But don't throw away your mouse yet.

Essentially, PaperPower lets you build and execute macros—short programs you can use to automate operating-system commands or application-program functions. First you design an overlay in which macros are organized as Keys (tablet areas that work like HyperCard buttons). Then the overlay is assigned a unique pattern of dots (called pips). This allows PaperPower to catalog and recognize different overlays. Finally, you print the overlay—this is where the paper comes in—and place it on the tablet surface, where the overlay identifies the Keys, making them accessible with a touch.

PaperPower treats an overlay as an extra layer of the tablet, with a background layer. The background layer is reserved for normal tablet operation, letting you use the tablet for drawing. You can switch between the overlay and background layers. You can also use multiple overlays at the same time.

You design overlays in PaperKeys, a separate program with tools for creating Key objects. You attach macros to Key objects by selecting functions from pop-up menus. The program offers an array of macro functions and can incorporate scripts built with the QuicKeys and Tempo macro-building programs.

However, PaperPower is not a panacea for the mousephobic. Even the most con-

Laying Over PaperPower builds macros, assigns them to tablet areas, and prints out paper overlays, letting you control functions right from your tablet.

firmed tablet users should expect to turn regularly to mouse and keyboard. Constructing the perfect overlay requires quite a bit of work—even if you only select macros from the pop-up menus.

Veterans of macro-building utilities should have little trouble using PaperPower, but novices will need to play around with it before they can build useful overlays. Beginners will find the manual hard to digest. The intro sections simplify some concepts beyond recognition, while the more technical sections can get a little dense.
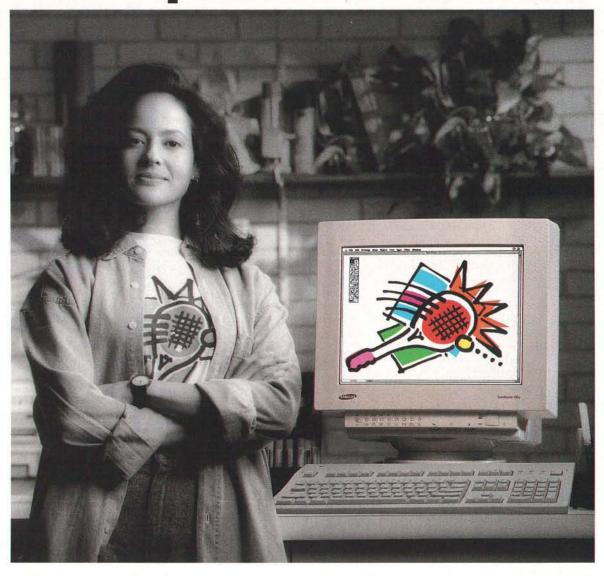
If you have more than one active overlay, or forget to switch to the background layer, the overlays can interfere with cursor movements while you use the stylus. Worse, stumbling on a Key can inadvertently trip another function, such as launching a program. PaperPower demands awareness—of where you are on the tablet, which overlay is active, and so on—and adjustment.

Consolidating functions for controlling your presentations is probably PaperPower's best application. It's too bad that the package doesn't include basic overlays for popular programs.

The Last Word On balance, Paper-Power gives life to an interesting idea and provides a useful tool for creating and using macros, but I don't think I'm quite ready to give up my mouse and keyboard.
—CARLOS DOMINGO MARTINEZ

Samsung.
Mac's new point of view.

SyncMaster 17GLs

It's about how you work on your Mac.
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Samsung designed the SyncMaster™ GL Series
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Whether you design on a Quadra workstation,
create multimedia presentations on a Power
Macintosh or need external video for your
PowerBook, the SyncMaster GL Series will
improve the way you view your work.

SyncMaster	14GL	15GL	17GL	17GLs
CRT Size	14"	15"	17"	17"
Dot Pitch	.28	.28	.28	.26
Maximum Resolution	1024 x 768	1024 x 768	1024 x 768	1152 x 870
Maximum Refresh Rate at Maximum Res. (Hz)	75	75	75	75
MPR-II (Low Radiation)	•	•	•	•
Power Management	•	•	•	•
Flat Square Screen		•	•	•
On-Screen Programming			•	•
Real Color Control				•
Warranty	2 Years	2 Years	2 Years	2 Years

*1994 Samsung Electronics America Inc. Image on SyncMaster 17GLs courtesy of Mike Quon
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Widget Workshop

I CAN HONESTLY SAY THAT THIS PRO-
gram is one of the coolest pieces of soft-
ware I have ever used."

"Totally awesome!"

Normally our handpicked crew of soft-
ware testers reserves this kind of praise for
games. But they're talking here about Wid-
get Workshop, a fiendishly clever science-
simulation kit from Maxis. Educational soft-
ware that's fun—now *that's* cool.

Widget Workshop is a mad scientist's
laboratory that allows you to build Rube
Goldberg–style widgets out of tools like
switches, light bulbs, metronomes, coun-
ters, speakers, and hearts. Hearts? No, this
isn't Mortal Kombat III. The hearts are
strictly clinical and mercifully bloodless;
they're included so you can, for example,
compare the heart rates of different species.

The widget-building process is simple:
you use the pointer to drag tools from
the tool tray onto the work area and link
them so each tool's output connectors
are connected to the input connectors
of other tools. When everything is con-
nected, you test your creation by clicking
on the Go button.

Double-clicking on a tool brings up a
dialog box that briefly describes the tool's
function, suggests possible uses, and offers
options for customization. For example, the
gravity chamber allows you to control not
just the type of object you drop, but the
amount of gravity.

When you first enter the workshop
you'll need some help figuring out what the
iconlike tools do and how you put them
together. An entertaining *Mad Scientist's
Guide* (one of two excellent manuals) leads
you through a series of projects to famil-
iarize you with the program. It quickly
moves from simple experiments to complex
simulations involving Boolean algebra and
computer logic gates—perhaps a bit too fast
for some users. Even though the package
recommends Widget Workshop for ages 8
and above, users at the young end of that
scale may need help with many activities.

The package includes several puzzles—
not-quite-finished widgets that serve as
brainteasers—and a bag of plastic tools and
toys for experiments that combine the phys-
ical world with the widget world. Still, users
may eventually wish for more—more work
space, more tools, more options for each
tool. Widget Workshop encourages imag-
ination and exploration, and that inevitably
leads into corners that the programmers
didn't anticipate.

The Last Word Widget Workshop
is so good that it's worth the minor disap-
pointment that results from running up
against the workshop walls. Perhaps future
versions will be enhanced and extended;
maybe they'll even allow plug-in additions.
In the meantime, hang the Do Not Disturb
sign on the laboratory. We've got work to
do.—GEORGE AND BEN BEEKMAN

Free Fall Ever wonder whether an elephant
dropped from Mount Everest on the Sun would hit
bottom before a feather dropped from the Empire
State Building on Jupiter? (Spoiler: The feather hits
bottom two seconds faster.)

CyberBoogie

F ROM BETTY BOOP TO *BEAUTY AND
the Beast*, song and dance have been sta-
ples of animated cartooning. CyberBoogie,
a CD-ROM–based program, lets kids par-
ticipate in this tradition. By manipulating
on-screen characters, even young children
can create animated dance routines to music
played by Sharon, Lois, and Bram, the hosts
of Nickelodeon's "Elephant Show."

CyberBoogie's designers have a fluid,
fun approach to the famously tedious task
of animation. First, you choose a back-
ground scene and a song for your cartoon.
With the music playing, drag a CyberBoo-
gie character, called an Ani-Mate, on stage.
You move the cursor near the Ani-Mate's
legs to lead the Ani-Mate through kicks or
jumps, or by its arm to add a wave. The pro-
gram records all moves and immediately
begins repeating them in time to the music.

Now that you've got it bopping to the
beat, dance your character around the
scene; the program remembers the path you
trace. Give your character a prop; it stays
with the Ani-Mate, and probably com-
mences mutating on an animation cycle of
its own. Bring in a second Ani-Mate, stick
it onto the first, and watch them dance
cheek to cheek.

Since CyberBoogie saves dances as a
series of instructions, even the most elabo-
rate production takes up less than 100K. (Of
course, the file will play back only if Cyber-
Boogie is loaded.)
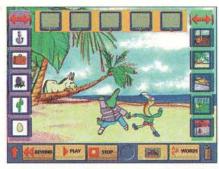
So far, so cool. So why did Cyber-
Boogie leave me and my juvenile judges less
than thrilled? I think it's because, at bot-
tom, this is a pretty confining program.

CyberBoogie trades power for simplic-
ity. That sounds reasonable, but in practice
it means that each cartoon progresses in
pretty much the same way. Music *must*
accompany all animation. You can't switch
backgrounds during a number. You're al-
lowed only a few characters on stage at a
time. Unless you have a 14-inch or larger
monitor, all characters in a piece must
remain on stage at all times. And so on.

Perhaps the most serious limitation of
CyberBoogie is that it puts you in a strict-
ly clip-art world. You can't draw or import
your own backgrounds. There's no facility
for creating new characters. And you can't
import or record sound effects or music.

And as CyberBoogie lacks any type of
editor for refining sequences, complex
choreography is a try-and-try-again affair.

The Last Word CyberBoogie's
makers rate it for children three to nine
years old; I'd say that the program's easy
interface, bouncy songs, and cute graphics
make it a good choice for kids at the low end
of that range. But the program's relative lack
of features probably restricts it to the same
group.—JOE MATAZZONI

Boogie Down You can choose background
scenes and songs from the rotating display on the
right side of the CyberBoogie screen; props and sup-
porting cast are on the left. The window shades cov-
ering the menus at the top mean there's not enough
memory to include another Ani-Mate.

Funny thing about the Macintosh® computer. With little fanfare and an idea known simply as "plug and play," it turned a whole lot of novice users into networkers.

And is it any surprise? All you have to do is plug a connector into your Macintosh, and you're networked. You can share printers. You can share modems. You can even share files with your peers.

This kind of "peer-to-peer" network is all some workgroups need.

Others, however, soon find they're ready to take the next step: a Workgroup Server dedicated to improving the ebb and flow of vital information.

How do you know if you're ready? Just ask yourself a few simple questions.

Do I have more than five computers tied together in a peer-to-peer network? Is one printer always backlogged while others sit idle? When people share files, are their systems slowing down? Is there confusion about who has the latest data and where it resides?

If you answered yes to any of these questions, it's definitely time to consider a Workgroup Server from Apple.

Workgroup Servers provide a centralized place for users to store and share files. Which means your shared files don't get lost, your systems don't slow down and users always have access to the latest information.

A server also gives you a place to put network applications and services—accounting programs, databases, e-mail and more—for everyone to use.

And that's just the start. With every Workgroup Server, you also get Dantz Retrospect Remote, so you can back up every system on the network—clients and servers—automatically. Plus Apple® RAID disk mirroring software, so you can rest easy about data reliability.

Want more still? Add FileWave software to your server, and you can easily distribute new programs and upgrades from the server. Or add Apple Remote Access software, and users can access your network from anywhere.

"OK," you say, "but how difficult is it to use a Workgroup Server?" It's as easy as using a Macintosh. All you have to do is connect the components, turn on the power, and you're ready to go.

Choosing the right server is just as easy. We have three models based on the new PowerPC™ RISC chip—the Workgroup Servers 6150, 8150 and 9150.

No matter which one you choose, you're backed by our expert phone support, 24 hours a day, 7 days a week.

And now, for a limited time, you'll get GraceLAN Server Manager software, a $395 retail value, at no extra charge.*

To get your free Workgroup Server brochure or for more information on our server trial program, simply pick up the phone and call us at 800-538-9696, ext. 430.** And unlock the power of your workgroup. The power to be your best.®

Apple

First

MACWORLD LAB TESTS

Clones

WHAT FEELS LIKE A MAC, PERFORMS LIKE A MAC, PLUGS AND PLAYS

like a Mac, and even quacks like a Mac, yet is not a Mac? The future.

Apple has code-named its forthcoming PowerPC 604–based PCI

Macintosh *Tsunami*, but the real sea change for Macintosh users has

already hit. Apple decided last fall to license the Macintosh Operating Sys-

tem. And the first wave of Mac clones was announced as 1995 began.

Macworld Lab has tested prototypes of these very first Mac clones. The

results? The first clones work as well as Apple's Macs. That alone repre-
sents an auspicious start to Apple's reversal of its decade-long go-it-alone
strategy. Although these first clones introduce no compelling new tech-
nologies, breathtaking features, or stunning industrial designs, they prove
that Mac clones can be legitimate alternatives to Apple's own Macs.

We evaluated late prototypes of three of the first four clone models:
desktop and tower Power Mac–compatibles from Power Computing Cor-
poration, a Milpitas, California, start-up company; and a 68LC040-based
tower from Bridgette, a small Southern California reseller of systems and
drives. (Neither company had clones on sale when we went to press.) But
the floodgates will open soon.

Within a few months, Radius will roll out high-end video worksta-
tions, which it announced in early January but is still developing. By
April, DayStar Digital will announce plans to produce clones for digital
photography and publishing. By next year, expect to see up to 30 Mac

clone makers: 10 to 15 small-timers,
mostly supplied by Apple and Power
Computing (which plans a large business
selling motherboards to other Mac-clone
developers); 5 to 10 niche players like
Radius and DayStar; and 2 to 5 medium-
size computer companies, such as Tai-
wan's Acer or Japan's Toshiba (see the
sidebar "Mac Clones: Who's Next?").

Clone makers will choose from four
basic approaches to creating clones—all
of which are already reflected in the
embryonic Mac-compatible market:

• Sell a few preconfigured models
with slightly more appealing features at a
lower cost than Apple does.

• Sell into specialty markets—such
as digital video, education, or selected
foreign markets—and perhaps package
computers with other devices to create
turnkey systems.

• Sell large volumes of inexpensive
systems at razor-thin margins; offering a
range of configurations.

• Sell machines that support popu-
lar features that Apple has phased out or
incremental innovations that Apple
declines to offer. Examples include clones
with both NuBus and PCI slots (after
Apple moves to PCI later this year);

BY CHARLES PILLER

PAUL FRANZ-MOORE

THE FIRST MAC-COMPATIBLES

VideoVision **Workstation**

New Mac Looks
The arrival of Mac-compatibles will mean a variety of designs and features. The temporary cases shown here give a hint of the looks that the first clone developers are exploring.

rad us

clones with built-in Ethernet transceivers, modems, and VGA ports; and clones that support 72-pin SIMMs. (Apple development documents indicate that the company is switching to 168-pin Dual In-line Memory Modules, or DIMMs, later this year. The new Mac/PC hybrid being developed jointly by Apple and IBM will also use these DIMMs; see "Mac Hybrids," in this issue.)

Half of Power Computing's business will be selling Mac-compatible systems to other clone vendors

STEPHEN KAHNG, president and CEO, Power Computing

Whatever approach clone makers take, until clones and their makers withstand the scrutiny of thousands of users, buying any clone will require customers to take a leap of faith. To make it a shorter leap, Macworld Lab tested not just performance, but compatibility with a wide range of hardware peripherals and software programs, and for look and feel. As part of that process, I wrote this article on the 100MHz Power Computing tower clone to discover the day-by-day feel any owner would experience.

Power Computing: Mainstream Macs
By the time this article appears, Power Computing expects to be within weeks of selling Mac-compatibles that offer modest improvements and cost 10 to 15 percent less than comparable Apple units—the Power Macintosh 8100/100 and 7100/80. Power Computing's machines are by far the most impor-

Variations on a Theme

This artist's rendering of the desktop case design to be used by Power Computing evokes the Mac's look and feel while remaining distinct.

tant in the overall development of the Mac-clone market; they are the only true clones available for testing (the Bridgette model repackages an Apple motherboard), and Power Computing plans to sell motherboards to other clone makers.

At the late prototype stage, the unnamed 80MHz desktop and 100MHz tower machines offer nearly flawless Mac compatibility—consumers can assume that with few exceptions, the peripherals and software they now use with a Mac will work with these machines equally well. And the Power Computing units run as fast as their Apple counterparts. The results hold firm across basic business and graphics applications, math-intensive modeling and data-analysis applications, and hard-drive performance.

First Offerings   Initially, Power Computing will offer only these two models, but it should rapidly

expand its product line at both the low and high ends over the next several months to include machines that support the Peripheral Component Interconnect (PCI) bus and the PowerPC 604 CPU. Power Computing even expects to release such systems shortly after Apple sells its first models using these technologies, later this year. Power Computing may also sell peripherals from Apple or other companies.

The systems we tested are in most ways similar to the equivalent Macs—including the use of Apple controller chips. This accounts, in large part, for performance nearly identical to that of the Power Macs. Down the line, Power Computing plans to produce its own controller chips—to enhance performance and reduce costs. The Power Computing machines also include several features that are identical to those found in their Power Macintosh counterparts: three open NuBus slots, built-in Ethernet, a 256K cache (expandable to 1MB), a SuperDrive floppy, and a 200-watt power supply.

But Power Computing offers several improvements over Apple's machines:

• The desktop unit can hold up to 200MB of RAM; the 7100's maximum is 136MB.

• Both units feature many accessible drive bays (three for the desktop model, one for the Power Mac 7100, four for the tower model, three for the 8100), although the 8100 offers two additional bays that are not accessible (for hard drives), while the Power Computing tower has no such bays.

• Like Apple's, the Power Computing machines support a single PDS slot. Apple uses its PDS slot for the High-Performance Video (HPV) card, which supports thousands of colors. Power Computing expects to use a card that includes a VGA standard connector (for PC-style monitors) and a Mac connector. Power Computing may ship some models without the card; those would support only 256 colors with their on-board video chips (comparable to the Power Macs' on-board video). For our tests, Power Computing supplied Apple's HPV card.

• Quadruple-speed (4×) CD-ROM drives may be used; Apple offers 2× drives as an option. The Power Computing prototypes we tested were not equipped with CD-ROM drives.

Power Computing's system design (except for the clock-oscillator chip that controls the CPU and bus speed, the two models' motherboards are identi-

WILLIAM MERCER MCLEOD

cal) suggests a thoughtful, sophisticated approach. This sophistication derives, in part, from help from Apple, as well as from the fact that two key Apple engineers recently joined Power Computing.

The components are all solidly constructed with proper shielding. The motherboard is laid out in a *baby AT* format—a cheap, widely available, well-understood industry standard—perfect for selling to Mac-clone makers that have PC-clone businesses.

Power Computing also offers a few user-friendly improvements over Apple machines. By putting I/O components on a card, Power Computing can offer upgrades without a motherboard replacement, and it can offer different I/O options (such as thin coax or 10BaseT for Ethernet). Moreover, the I/O card plugs into a custom slot, saving a NuBus slot. Another welcome change: the cache and SIMM slots are much more accessible than on Apple's machines.

Unfortunately, Power Computing also made a few cost-saving compromises:

• Both models use nonstandard clock oscillators, so they won't work with current CPU boosters.

• The tower model offers a maximum of 200MB of RAM; the 8100's maximum is 264MB. This is because Power Computing uses no on-board memory, relying instead completely on SIMMs (72-pin, 70ns, like Apple's).

• Neither Power Computing machine has an interrupt button, although only programmers who do not use MacsBug will find this annoying.

Also, Macworld Lab experienced difficulty inserting three NuBus cards simultaneously due to a

flaw in the case; Power Computing says the problem will be fixed in shipping versions.

Compatibility Tests Clearly, the most important test is compatibility—less than 99 percent compatibility would probably kill any clone. The results of Macworld Lab's hundreds of tests with scores of devices and applications show that Power Computing understands this fundamental principle. We tried a range of printers (ink-jet and laser); a tape drive and a scanner; fax modems; Ethernet cards; input devices; video cards; SCSI accelerators; and optical, CD-ROM, and removable hard drives and drivers (see "Power Computing Clones: First Lab Tests").

The hardware tests revealed only three problems. When using the RasterOps Paintboard Prism video-display card, the screen image shakes—possibly due to a NuBus problem or a low-level software incompatibility. With the Atto SiliconExpress IV SCSI-2 accelerator, we experienced occasional errors using BlitzCopy and making Finder copies—possibly a software incompatibility with the driver that the Atto SCSI board installs. And the stereo-output jack on the desktop model actually provides mono output—but this should be corrected in the shipping version.

We also conducted a range of tests with dozens of leading applications, including page-layout, graphics, CAD, video-editing, word processing, networking, compression, mathematics, database, and virus-detection programs. Compatibility was nearly perfect; Microsoft Word 6.0, which suffers from extension conflicts on any Mac, encountered them more easily on the Power Computing clones.

Motherboard Transformed

Power Computing's prototype Power Macintosh–compatible motherboard (below left) fits an Apple 8100 series motherboard (right) into a baby AT format—an inexpensive standard in the PC industry. Only three NuBus slots will be included on the shipping version.

PDS slot (for video)
NuBus slots
Custom I/O slot
PDS slot (for video)
NuBus slots
ROM
L2 Cache
I/O controller
Memory I/O controller
High-speed memory controller
High-speed memory controller
Bart chip
Bart chip
ROM
SIMM slots
Power PC 601 processor
On-board RAM
SIMM slots
L2 cache

Power Computing Clones: First Lab Tests

Highly Compatible

SOFTWARE

Columns: Tower system (100MHz), Desktop system (80MHz)

Software	Tower (100MHz)	Desktop (80MHz)
ACI US 4th Dimension 3.2	●	●
Adobe Illustrator 5.5	●	●
Adobe PageMaker 5.0a	●	●
Adobe Premiere 4.0	●	●
Adobe Type Manager 3.8.1	●	●
Aladdin StuffIt Deluxe 3.5	●	●
Apple HyperCard 2.1	●	●
Apple QuickTime 2.0	●	●
AppleScript (basic functionality)	●	●
Ashlar Vellum 3D 2.63	●	●
CE Software QuicKeys 3.0	●	●
CE Software QuickMail 3.0	●	●
ClarisDraw 1.0	●	●
Claris MacWrite Pro 1.5v3	●	●
ClarisWorks 3.0	●	●
Compactor Pro 1.5	●	●
Datawatch Virex 5.5	●	●
Engineered Software PowerCADD 1.0	●	●
Farallon Timbuktu Pro 1.0	●	●
Frame Technology FrameMaker 4.0.4	●	●
Graphisoft ArchiCAD 4.5+	●	●
Graphsoft BluePrint 5.0	●	●
Graphsoft MiniCAD 5.0.1	●	●
Microsoft Word 6.0	●[A]	●[A]
Novell WordPerfect 3.1	●	●
QuarkXPress 3.31	●	●
Ray Dream Designer 3.11	●	●
SoftArc FirstClass 2.6 client	●	●
Specular Infini-D 2.6	●	●
Strata StudioPro 1.5	●	●
StrataVision 3d 3.1a	●	●
Symantec Norton Utilities 2.0 Speed Disk	●	●
Wolfram Research Mathematica 2.2.2	●	●

HARDWARE

Columns: Tower system, Desktop system

Storage Systems

	Tower	Desktop
88MB SyQuest drive	●	●
90MB Bernoulli drive	●	●
650MB optical drive	●	●
Apple CD-ROM driver	●	●
APS HyperDAT tape drive via Retrospect	●[B]	●
Atto SiliconExpress IV SCSI-2 accelerator	●[C]	●
Casa Blanca Works CD-ROM driver	●	NT
External hard drive	●[D]	●
Format hard drive w/Casa Blanca Works Drive7	●	NT
Format hard drive w/CharisMac Anubis 2.52	●	NT
Format hard drive w/FWB Hard Disk ToolKit 1.5	NT	●
Format, read, write 1.4MB floppy disk	●	●
Format, read, write 1.4MB PC disk w/PC Exchange	●	●
Format, read, write 800K floppy disk	●	●
FWB CD-ROM driver	NT	●
FWB JackHammer SCSI-2 accelerator	●	●[C]
NEC CD-ROM driver	●	NT
NEC MultiSpin 3X CD-ROM drive	●	NT
SCSI chain, 6 devices	●	●
Toshiba 3501 4X CD-ROM drive	●	NT

Graphics and Video Hardware

	Tower	Desktop
Apple One Color Scanner w/Light Source Ofoto	●	●
Apple PDS-based video card	●	●
Internal video circuitry	●	●
Radius PrecisionColor 24X	●	●
Radius Thunder IV GX 1360	●	●
Radius Video Spigot	●	●
Radius Photo Engine	●	●
RasterOps Paintboard Prism	●[E]	●[E]

Input Devices

	Tower	Desktop
Apple keyboards, mouse	●	●
Kensington Smart Mouse	●	●
PlainTalk microphone	●	●
Wacom tablet	●	●

Telecommunications

	Tower	Desktop
AppleShare as client	●	●
AppleShare as server	●	●
Asanté Ethernet card	●	●
Connect to ARA 2.0 via V.34 modem	●	●
Connec to FirstClass BBS via V.32 and V.34 modems	●	●
Connect to Shiva LanRover via V.34 modem	●	●
Farallon Etherware Card	●	●
Fax via Global Village modems and software	●	●
PostScript fax via Apple LaserWriter 16/600 PS	●	●
CE Software QuickMail 3.0 as client	●	●

Printers

	Tower	Desktop
Apple Color StyleWriter 2400	●	●
Apple LaserWriter 16/600 PS (AppleTalk)	●	●
Apple LaserWriter 16/600 PS (EtherTalk)	●	●
Apple LaserWriter 630 (AppleTalk)	●	●
Apple LaserWriter 630 (EtherTalk)	●	●
Epson Color Stylus	●	●

● = passed; NT = not tested. [A] With many system extensions loaded, Word would not run. [B] Needed to increase Restrospect's memory allocation over normal for a Power Mac. [C] Occasional errors could have been caused by card-driver conflict, not Power Computing's hardware. [D] Occasional system crashes with DATerm on. [E] Video display was shaky.
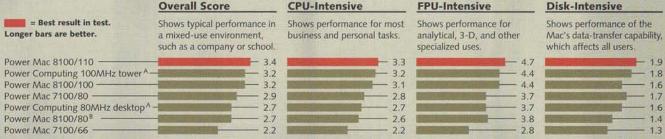
BEHIND OUR TESTS

Macworld Lab conducted more than 400 compatibility tests of Power Computing's Power Mac clones. Although both systems were prototypes with some development work yet to be completed, Macworld Lab found very few compatibility issues. —**Macworld Lab testing by Matt Clark, Mark Hurlow, Danny Lee, and Tim Warner**

As Fast As an Apple

Results are times as fast as a Centris 650 (Centris 650 = 1.0). Products are listed in decreasing order of overall performance.

■ = Best result in test. Longer bars are better.

Product	Overall Score	CPU-Intensive	FPU-Intensive	Disk-Intensive
	Shows typical performance in a mixed-use environment, such as a company or school.	Shows performance for most business and personal tasks.	Shows performance for analytical, 3-D, and other specialized uses.	Shows performance of the Mac's data-transfer capability, which affects all users.
Power Mac 8100/110	3.4	3.3	4.7	1.9
Power Computing 100MHz tower [A]	3.2	3.2	4.4	1.8
Power Mac 8100/100	3.2	3.1	4.4	1.6
Power Mac 7100/80	2.9	2.8	3.7	1.7
Power Computing 80MHz desktop [A]	2.7	2.7	3.7	1.6
Power Mac 8100/80 [B]	2.7	2.6	3.8	1.4
Power Mac 7100/66	2.2	2.2	2.8	1.3

[A] Early prototype; final performance may increase somewhat. [B] Discontinued product.
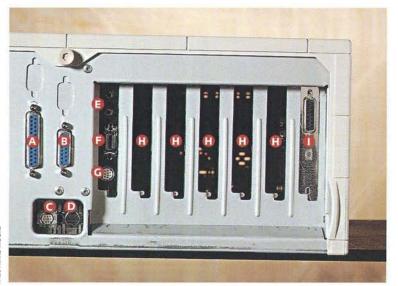
BEHIND OUR TESTS

Macworld Lab tested several functions in eight key programs plus the Finder to determine real-world performance for the three critical performance areas faced by most users: basic processing (the CPU-Intensive score), math processing ability for specialized applications like modeling (the FPU-Intensive score), and hard drive performance (the Disk-Intensive score). We then averaged the results (giving the CPU-intensive score 60 percent of the weight) to derive the overall score, which gives most business users an accurate measure of their Mac's performance. (Due to rounding, some insignificant differences in various results are not reflected in the overall scores.)

These results may be compared with the benchmarks of Mac systems and upgrades in the January 1995 and later issues.

We tested native PowerPC versions of software on the Power Macs and Power Computing Mac clones. The software included System 7.5; Adobe Illustrator 5.5, PageMaker 5.0a, Photoshop 3.01, and Premiere 4.0; Fractal Design Painter 2.0; Microsoft Excel 5.0; Specular International Infini-D 2.6; and Wolfram Research Mathematica 2.2.2. All systems tested had 24MB of RAM and were run with 8-bit color on 16-inch monitors.—**Macworld Lab testing supervised by Lauren Black and Mark Hurlow**

Mac-Clone Ports

This back panel of a Power Computing desktop prototype includes these ports: (A) SCSI; (B) on-board video; (C) AppleTalk; (D) ADB; (E) audio I/O; (F) Ethernet; (G) serial; (H) NuBus (only three will remain on the final version); (I) high-performance video.

These clones are virtual Macs in their functionality and performance. But do they feel like Macs? Do subtle flaws provide nagging reminders that these are less than the real thing? After living with the Power Computing tower for several days, I can say without reservation that they might as well be Macs. Macworld Lab's technical analysts agree.

A Good Value?   So we know that Power Computing will enter the Mac market with high-quality machines. Unfortunately, what we don't know will ultimately determine whether these clones are competitive: the company has not yet announced its final configurations; policies for warranty, software bundling, and technical support; and most important, pricing. Power Computing says it plans to undercut Apple prices by 10 to 15 percent on comparable models. Time will tell if added value and modest price competition will push consumers past any hesitancy about the clone alternative.

Power Computing plans to take orders only via the Internet until the company ramps up production and establishes a standard mail-order infrastructure, either on its own or with one or more large mail-order catalogs. (The Internet address is info@powercc.com.) The company says it will have only about 1000 machines to sell in the first month after they begin shipping in mid to late March.

Even at only a 10 percent price break, these clones should be well worth the money. Still reluctant to make that leap of faith? Consider this: Apple needs Power Computing to succeed and has publicly identified itself with the new company. If Power Computing can pull together a solid service-and-support operation, the risk should be small.

Radius: Creators' Clones

The second announced clone maker, Radius, merged with SuperMac Technology last year to become the dominant supplier of Mac video-display and video-production cards. It plans clones consistent with its expertise: high-end digital-video and color-publishing systems. Radius intends to wrap a Mac-compatible computer around its expensive video cards, then add a RAID storage system, monitors, and software to provide a turnkey system for multimedia profes-

sionals. The company would also sell clones separately—but only machines designed to fit into an overall Radius multimedia system.

No prototypes were ready to test for this article, and Radius has not announced pricing, configurations, or release dates, although it expects to have these details by early March.

By selling clones within its core business, Radius hopes to help buyers justify the purchase of costly add-ons; buyers can factor in Radius's ability to ensure that all components work together reliably. A source close to Radius says that the company may offer special furniture designed to show calibrated monitors in the most accurate light.

Radius may be an ideal niche player for several reasons: it has a strong reputation for high quality, a well-established customer base, in-depth knowledge of the Mac, and the ability to support specialized customers more effectively than Apple can. Radius is one of the few companies with prior experience licensing the Mac OS: the Rocket accelerator was essentially a Quadra 950 on a card. Radius's "Skylab," a multiprocessor-based publishing server, never saw the light of day, but it gave the company invaluable insight into the intricacies of designing a Mac clone.

If Radius can come up with a cost-effective system—and the company's history suggests that it can—Radius clones should be a relatively safe bet for the right consumers.

DayStar: Going for Speed

A source close to DayStar Digital, primarily known for its Mac accelerators, says that the company will soon announce plans to produce a high-end publishing and multimedia clone for release by the end of the year, and that the company may eventually produce midrange clones as well.

"[Their clones] will provide workstation performance . . . offering something faster than what Apple has." The source implies that the clone would use new compression techniques and would be designed for memory- and speed-intensive applications such as 3-D modeling, digital photography, and complex desktop publishing. DayStar intends to cede the video market to Radius, according to the source.

Is DayStar equipped to produce clones worth buying? The answer is not as clear as with Radius.

On the positive side, DayStar enjoys a reputation for reliability and quality and probably has more experience working with PowerPC chips than any other independent Mac developer. It produces PowerPC-based upgrade cards and therefore has the experience in system design needed to pull off the technical side of creating a fast clone.

But DayStar's relations with Apple haven't always been cozy, and its timing and strategy haven't always panned out. Much of DayStar's core business (like that of many other accelerator companies) evaporated when Apple brought out cheap Power Macs and PowerPC accelerators. The company adjusted by developing high-end PowerPC-based accelerators—DayStar's 100MHz PowerPro ($2199, 404/967-2077) is now the fastest Mac Quadra upgrade available—but it didn't arrive till early 1995, so long after equally fast and even faster Macs were introduced that the company lost the jump on Apple.

The need to redesign an earlier version of the 100MHz card to keep the price down may account for the delay.

Moreover, Apple cut off a prime opportunity for DayStar when it swallowed the low-end PowerPC upgrade market. Apple's Power Macintosh Upgrade Card for Entry-Level Macintosh (the one codeveloped with DayStar, which calls its version the Pow-

In the long run, the overall Mac OS market will grow much faster than the cannibalization rate by clones

DON STRICKLAND, Apple's vice president for licensing

erCard 601) sells for $599. DayStar's cards have been going for $679 to $749 via mail order—a price no one who knows about the Apple alternative will pay.

Unless DayStar can sell clones at a price well below that of Apple's fastest Macs—and many of DayStar's accelerators have already become too expensive to compete against Macs—this is probably a strategy for failure. Apple routinely speeds up its machines a couple of times a year. Without a lucrative high-end niche (like Radius's), DayStar faces an uphill battle attracting Apple customers based on relatively modest, short-lived speed improvements.

DayStar might have better luck in a business it

Floppy drive slot   SCSI connector
                     I/O controller

Audio I/O

Ethernet

Serial port

POWER

Audio controller   Memory I/O controller

I/O on a Card
Power Computing moves its I/O circuitry to an add-on card. This enables upgrades without replacing the motherboard.

PAUL FRANZ-MOORE

understands well: low-cost PowerPC motherboard replacements to Mac models that Apple has abandoned as upgrade candidates—such as most of the Mac II–, LC-, and Performa-series machines. DayStar says it is exploring such replacements.

Bridgette: Repackaged Systems

Bridgette tackles the clone market from a totally different angle: its first model—called the Quatro 850 and sold under the Cutting Edge brand name—is an inexpensive and expandable Mac-compatible. The system we tested was based on a 25MHz 68LC040 (no math coprocessor) Centris 650 motherboard coupled with a CPU booster from Newer Technology, which improved clock speed to about 31MHz, compared with the Quadra 650's 33MHz. (The LC040-based Centris 650 motherboard was discon-

tinued by Apple shortly after the Centris 650 began shipping; Apple then used the full 040 for all Centris 650 models.) The Quatro 850 (which sounds strangely reminiscent of Apple's Quadra 800) performed at the same speed as would be expected from an equivalent Apple model; compatibility with applications and peripherals was also fine. Because the Quatro merely reuses Apple parts, we do not include it in our benchmarks.

While the Quatro performs like a comparable Mac, its design has a haphazard quality. For example, the CPU booster obstructs use of one of the three NuBus slots. You cannot turn the power on from the keyboard, and if you shut the system down using software, the monitor turns off, but the clone itself doesn't. Also, the Quatro ships with a Next mouse and keyboard. While Mac-compatible, the keyboard has a different layout and takes some getting used to.

Expandability Options   The Quatro 850's primary selling point is expandability. It improves on the Quadra 650 by adding more drive bays (five; the Quadra 650 has three), a 3× CD-ROM drive (the Quadra 650 has a 2× option), and a SyQuest 270MB removable-cartridge drive (which was not connected in the prototype tested). The unit also ships with a 365MB hard drive, 8MB of RAM, 1MB of VRAM, and a few software utilities.

Does this configuration make sense for very many people? Probably not. The main selling point of the Quatro 850 is the ability to add internal storage such as large hard drives and tape, optical, or removable-cartridge drives. People who typically need such high storage capacity generally work with massive graphics, database, CAD, or photographic files. These are the very people who aren't likely to be enthusiastic about the performance they'd get on a 68LC040-based machine—at the low end of Apple's current lineup.

Moreover, most people who need tower computers want the big and bulky boxes off their desks. But to use the Quatro 850 effectively, you would load it up with removable-media drives that require you to keep the tower within easy reach. The design requires you to open a door on the front panel to access the drives, which increases the machine's footprint on the desk by about 20 percent.

Priced Right?   Still, on price alone a Quatro 850—$1749 mail order for the model we tested—

WILLIAM MERCER MCLEOD

could certainly find buyers. (Bridgette has offered dealers seven system configurations, with estimated street prices ranging from $999 to $3699.) But probably not many. The closest Apple Mac now on the market is the Performa 575, which comes with a smaller hard drive and less RAM than the Quatro 850 and lacks a SyQuest drive. But the 575 matches the Quatro 850's performance and includes a fax-modem and color monitor. The Performa 575 sells for less than $1800; boosting RAM to 8MB would cost an additional $150. To be sure, the 575 lacks the Quatro 850's storage and NuBus expandability; but the example makes it clear that Bridgette's pricing, while competitive, is no fire sale.

How does Bridgette set prices as low as they are? Bridgette obtains Mac motherboards from discontinued models and repackages them. Bridgette says it will eventually develop Power Mac–compatibles in this way, and it may develop its own motherboards

or purchase boards from Power Computing.

Feeling Lucky? Is Bridgette a safe bet for consumers? To answer the question, consider this history: Bridgette was formed in 1992 out of the ashes of the Wyoming-based peripherals reseller Ehman, Inc. (The brand name Cutting Edge was also obtained from Ehman.) Founder Michael Ehman closed the company in 1992 after amassing some $4 million in debts. Just before the company closed, former employees said that Ehman, Inc., routinely sold used hard drive mechanisms as if they were new (see *Conspicuous Consumer*, August and October 1992).

Michael Ehman serves as Bridgette's product manager. He tells *Macworld* that the company employs seven people, including his wife, Deborah Inman, who serves as president. He says that Bridgette is privately held by a group of investors and that he has no ownership interest. Ehman acknowledges, however, that "I was the driving force behind con-

Mac Clones: Who's Next?

Several major computer companies are poised to enter the Macintosh clone market. Whether and when they take the plunge will depend on their negotiations with Apple and the fortunes of their other markets. Based on conversations with industry sources, *Macworld* has identified the companies most likely to ship clones in the next two years.

—Cameron Crotty and Nancy Dunn

1995–1996

MOTOROLA

- *PC sales:* Just entered workstation market.
- *Primary business:* OEM of chips (including several PowerPCs), embedded controllers, power supplies, modems, and pagers.
- *PowerPC/Apple ties:* Partner with IBM and Apple in PowerPC development. Now offers PowerStack series of PowerPC-based servers for Unix and Windows NT.
- *Potential role:* Motherboard manufacturer, systems OEM, workstation systems that also run Mac OS.

ACER

- *PC sales:* 264,000 in Q2 1994.
- *Primary business:* OEM and reseller of desktop, server, and notebook computers and peripherals.
- *PowerPC/Apple ties:* Reportedly manufactured the PowerBook 145.
- *Potential role:* OEM and branded systems.

IBM

- *PC sales:* 892,000 in Q2 1994.
- *Primary business:* OEM and reseller of mainframe computers, desktop and server PCs, and notebooks. Also, wide range of peripherals and software.
- *PowerPC/Apple ties:* Partner with Motorola and Apple in PowerPC development.
- *Potential role:* Reseller in the short term; in the long term will focus on the converged PowerPC platform.

TOSHIBA

- *PC sales:* 290,000 in Q2 1994.
- *Primary business:* OEM and reseller of notebook computers.
- *PowerPC/Apple ties:* Has license to make PowerPC CPUs.
- *Potential role:* Systems OEM and reseller.

ZENITH DATA SYSTEMS

- *PC sales:* 158,000 in Q2 1994.
- *Primary business:* OEM and reseller of desktop, server, and notebook computers and peripherals.
- *PowerPC/Apple ties:* Parent company Groupe Bull, a member of the PowerOpen consortium, has announced PReP-compliant PowerPC servers.
- *Potential role:* Systems OEM and reseller.

olivetti

- *PC sales:* 140,000 in Q2 1994.
- *Primary business:* Parent company is computer and peripherals OEM and reseller based in Italy; recently

launched telecommunications group.
- *PowerPC/Apple ties:* Reported to be negotiating with Apple, Motorola, and IBM to market PowerPC-based machines. Funds the Mac-clone maker Power Computing.
- *Potential role:* Systems reseller in Europe.

VOBIS

- *PC sales:* 96,000 in Q2 1994.
- *Primary business:* Desktop PC reseller based in Germany.
- *PowerPC/Apple ties:* None.
- *Potential role:* Systems reseller in Europe.

BANDAI

- *PC sales:* Just entering market.
- *Primary business:* Toy maker.
- *PowerPC/Apple ties:* Licensed the Mac-compatible Pippin multimedia-player platform from Apple (see "Apple Licenses Game Player," *News*, in this issue).
- *Potential role:* OEM and seller of branded game systems.

1996 and Beyond

NEC

- *PC sales:* 420,000 in Q2 1994.
- *Primary business:* OEM and reseller of mainframe, desktop, and laptop computers and peripherals; leads Japanese market in PC sales.
- *PowerPC/Apple ties:* None.
- *Potential role:* Systems OEM and reseller.

DELL

- *PC sales:* 292,000 in Q2 1994.
- *Primary business:* OEM and reseller of PCs, servers, and notebooks.
- *PowerPC/Apple ties:* Several former Apple executives now work there.
- *Potential role:* Systems reseller.

FUJITSU

- *PC sales:* 126,000 in Q2 1994.
- *Primary business:* OEM and reseller of desktop, server, and laptop computers and peripherals.
- *PowerPC/Apple ties:* Has agreements with Apple for multimedia software development.
- *Potential role:* Systems OEM and possible reseller in Asia.

Canon

- *PC sales:* 6000 in 1992.
- *Primary business:* OEM and reseller of desktop and server computers and peripherals.
- *PowerPC/Apple ties:* Invested $11 million in FirePower Systems.
- *Potential role:* Systems OEM (via FirePower) and reseller in Asia.

FirePOWER

- *PC sales:* Just entered market.
- *Primary business:* OEM developer of PowerPC desktop and server systems.
- *PowerPC/Apple ties:* Announced PReP-compatible systems last year; promised to deliver boards that comply with the Moccasin specification within 90 days of its publication.
- *Potential role:* Systems OEM.

Apple's

Clone Strategy

Apple has only one chance to stay competitive and increase its share of the computer industry. Cloning is that chance, and it's hardly a new idea even for the Mac. Last year Cupertino-based NuTek released the Duet, a Mac-and-PC-compatible, without Apple's help. But the complexity of reverse engineering was too formidable; the NuTek machine failed in performance, compatibility, time to market, and cost (see *Reviews*, February 1994).

Things will be different now that Apple CEO Michael Spindler has made the decision to jump-start Mac clones. The Mac-clone industry will bear certain similarities to the PC-clone industry of the 1980s, but there will also be key differences. Unlike Apple, IBM never promoted cloning; it never issued a standard specification for PC architecture and didn't own its operating system. The result: a lot of junk emerged along with good machines. And a raft of incompatibilities characterized the market as a whole. Unlike IBM, Apple has an overall strategy for a clone market—a strategy designed to grow Apple.

To avoid the incompatibility trap, Apple is setting basic rules for implementation. The Power Computing machines suggest that Apple's ownership of the Mac OS and ROM should make it possible to enforce relatively high standards.

Open Licensing

Any company that licenses the Mac OS can market computers in any geographic area using any method of distribution it chooses. This ensures a broad range of licensees and makes Mac clones a viable proposition for the biggest PC companies. "[Will] third parties grow the overall Mac OS market?" asks Apple's vice presi-

dent for licensing, Don Strickland. "We believe that they will."

The first announced clone makers, Power Computing and Radius, have gotten most of the attention, but the seriousness of Apple's approach is also apparent in the first licensee of the Mac OS—Bandai, the giant Japanese producer of the Mighty Morphin Power Rangers, a TV show and toy series that haunts nearly every parent of a child between ages four and nine. Bandai will produce a Nintendo-like game platform called Pippin that uses a limited form of the Mac OS.

It may seem like a typical Apple misstep to license first to a toy maker, feeding into the stereotype that Macs are not serious business computers. But the Bandai deal actually shows Apple's sophistication—CD-ROMs developed for Pippin will play on Macs without modification, and if Pippin finds a fraction of the audience of Bandai's other ventures, it will spin many developers into the Mac OS orbit.

Structured for Growth

Apple plans to take several steps to ensure that clone makers succeed. The company will sell the Mac OS at a nominal fee, so that clone makers can keep their prices competitive against both Apple Macs and Windows PCs. Apple intends to help the initial clone makers get started by providing marketing assistance.

Apple will make key chip sets, motherboards, and other essential parts available at a reasonable price. In general, Apple is working to replace Mac-specific parts with generic PC equivalents to reduce supply costs for itself and the clone makers alike. And Apple has helped Power Computing build its own motherboard—based on the popular

baby AT PC format—for sales to other clone makers. Expect clones based on this design to go after the business market aggressively in coming months.

Apple will also offer peripherals to clone makers for sales with the Apple logo or the clone makers' brands. "We ask what other help Apple can provide to make the clone systems appealing to customers—right down to cards and cabling, ClarisWorks, and eWorld," says Strickland.

Facing Competition

Apple will remain the overwhelming force in the Macintosh market

MICHAEL SPINDLER, president and CEO, Apple

for the foreseeable future. But it will begin to face serious competition by 1996 when Macs based on Moccasin, the converged-hardware reference platform, begin to appear.
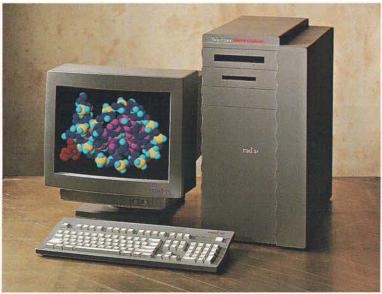
What part of the overall market does Apple intend to own? How will the company differentiate itself in the long run? Apple vice president Ian Diery cites the business publishing and graphics, education, and home markets as key to Apple's strategy. "You will see us focus our dollars and energies on these markets and customer uses that have made us successful, where we are the market leader," he says. "We will continue to stand out by being the best at the user interface, multimedia, graphics, communications, and collaboration."

Clearly, look for Apple to

retain the notebook market for some time. Apple's designs are so popular, says Carl Hewitt, Power Computing's software engineering manager, that "unless someone licenses both the product design and the computer, why bother? Then you'd have to compete [against Apple] on manufacturing—and could win, but that's not a race most people would want to enter."

"Most licensees will want to use the chip of the future," says Strickland, "and we don't yet have [PCI- or] PowerPC-based notebooks." Still, Strickland predicts that PowerBook clones will follow about a year after desktop models.

Top Challenges

Strickland predicts that the Mac OS market share won't show much growth until clones have had six to nine months to establish a presence. During this period, clone companies will primarily take what would have been Apple's sales. Apple is convinced, however, that the overall Mac OS market will grow much faster than the "cannibalization rate," as Strickland calls it. And if clones really take off, Apple might become the hungriest cannibal.

To make clones successful in the long run, Apple needs a big player—like IBM or Compaq—to license the Mac OS. But don't count on a company of that size to jump in until after Moccasin is completed. Moccasin will offer the economies of scale and multiple-OS flexibility that big players need to justify a major foray into the Mac market.

Moccasin will also relieve Apple of a big headache: being the sole source of support for clone makers. "We're resigned to the fact that we're going to have to provide substantial help [for now]," says Strickland, "but we don't want to be in that business long term."

**Multimedia
Workstation**

Radius has announced a
video workstation that it
expects to package with
a monitor, RAID storage
system, video card, and
software for multimedia
professionals.

port—and do so fast enough to satisfy customer demand if its products gain popularity quickly. Many companies ascend overnight only to collapse due to lack of organization in a single key area.

Power Computing also might have to settle for very narrow profit margins to woo customers away from Apple, even if the Power Computing clone product is superior. Eventually, it has to offer such compelling deals that the Mac OS market broadens beyond current Mac buyers—a difficult task when Intel-based PCs offer a similar range of features.

In its favor, Power Computing has produced solid technology. By working on system designs even before it secured a license for the Mac OS, Power Computing leaped ahead of potential competitors. And Power Computing has adopted a mail-order sales strategy, following the examples of Dell Computer Corporation and Gateway 2000 in the PC market. This makes sense because Apple has not focused on this method of distribution.

Power Computing's ultimate success or failure, like that of all clone makers, will depend on containing costs. This is where CEO Stephen Kahng comes in. Best known for his design of the Leading Edge Model D—a top-selling PC clone of the mid-1980s—Kahng is well known and respected in the industry. He will make sure that Power Computing uses as many standard PC parts as possible to keep costs down. And Kahng's network of contacts around the world should keep manufacturing costs low. (Kahng predicts his company will sell 100,000 units in the first year and that Power Computing will become a $1 billion company in five years.)

Although Power Computing is a start-up, Italian computer giant Olivetti is its primary investor. Olivetti has long considered jumping into the Mac-clone market and clearly views Power Computing as its first entry point. This could mean solid backing for warranties and development promises.

Finally, Power Computing intends to become a major supplier of Mac-compatible motherboards. The company has already made a large initial investment in system design. Selling motherboards to other clone makers will let Power Computing leverage its investment, with an eye toward eventually making its systems a second Mac standard.

On balance, Power Computing looks poised to succeed, even if it doesn't achieve Kahng's grandiose predictions. If the company's clones do take off, look for the Mac industry to transform itself rapidly. The current clones are a proving ground for both Apple and the new industry it's trying to spawn. The biggest, most important players in the computer industry—including IBM and Compaq—are looking on with keen interest, assessing the approaches of the Mac-clone pioneers.

After the converged Mac/PC platform is released, those giant computer companies will decide whether to try to take over a big share of a growing Mac-compatible market. If they do, the world of Macintosh might look a lot like the world the rest of personal computing resides in. If you care about the survival of the Mac, that's the best news in years. **m**

vincing those investors [to form Bridgette], so I'm kind of responsible for making sure their money is returned to them some day." Ehman adds that he personally owes more than $1 million to creditors associated with Ehman, Inc., and that he may need to declare bankruptcy soon.

In fairness, many companies go out of business, then reorganize successfully. According to Ehman, Bridgette has supported and will continue to support all of Ehman customers through its toll-free number; a spot check by *Macworld* verified that technical support is indeed available.

History aside, however, there are other reasons to question whether Bridgette has actually found a viable formula for making a clone. Ehman and Newbom say that a partner (whom they would not name) buys the company's motherboards from Apple. But Apple spokeswoman Jeni Johnstone says that neither Bridgette nor any other part-stripping operation has signed or been offered a license for the Mac OS. No license, no legitimate clone.

The Last Word

Whether or not Bridgette succeeds, the Bridgette scenario holds important lessons for potential consumers of Mac-compatibles. Many small companies will try to cash in on this new opportunity. Just as in the PC-clone market of the 1980s, unsanctioned gray markets will emerge in the Mac-clone market of the 1990s. The clone market will become polluted by computers that do not meet the strict compatibility standards that are the core of Apple's licensing program (see the sidebar "Apple's Clone Strategy"). Moreover, many clone makers will rise and fall with breathtaking speed, leaving consumers without recourse. It's an inevitable facet of a new industry.

The initial test of the Mac-clone concept, however, will be whether a producer of mainstream clones for the mass market can succeed. For now, that company is Power Computing. What can be predicted from Power Computing's strengths and weaknesses? The company has to solve the classic problems of an ambitious start-up. It must build an infrastructure for manufacturing, sales, and sup-

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Senior editor CHARLES PILLER reports on Macintosh clones and the links between the Macintosh and other operating systems.

Mac

MACWORLD GIVES YOU

Hybrids

APPLE ALWAYS GAMBLES TO ACHIEVE GREATNESS. NOW THE COMPANY IS

taking its most important strategic gamble since the Mac's genesis

a decade ago. It has committed to a new future for Macintosh com-

puting—a future at odds with Apple's past approach, with its historic

corporate sensibilities, and indeed, with the idealized, rebellious image

that Apple invented and promoted. The future of Apple is now

the future of all personal computing: convergence.

Apple announced in November 1994 that, together with IBM and Motorola, it would create a new computer platform that can run all of the major operating systems except Windows 3.1 and Windows 95. It also declared its intention to openly license the Macintosh Operating System (see "First Clones," in this issue). Through licensing, Apple expects to grow the Mac OS market share dramatically.
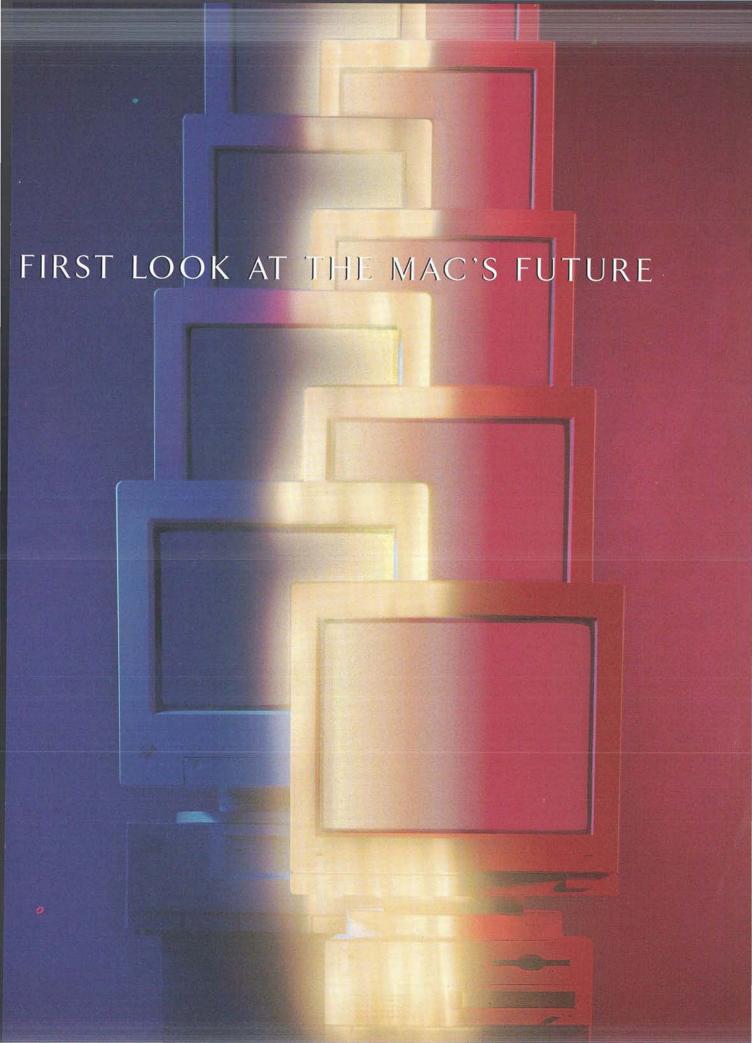
If the strategy succeeds, Apple could see its trendsetting technologies seized not just by millions of new Macintosh users, but gradually by the industry as a whole, as those technologies are adopted by manufacturers of the generic platform. But if this strategy fails, Apple will probably become increasingly irrelevant to the larger PC environment. The company's survival would clearly be at stake. Risky. But not as risky as standing still, when stagnation inevitably means being crushed by relentless competitors. This move represents Apple's last best hope for a serious challenge to the Intel-Microsoft standard.

Apple's strategy is no half measure, as demonstrated by three crucial and related decisions:
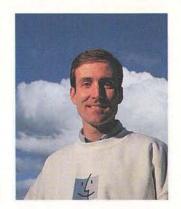
• The company will gradually phase out the current Power Mac platform in favor of new computers based on Moccasin, one code name for the new converged platform. The first Moccasin-based machines from Apple, due out in late 1996, will be higher-end Macs; but before long, Moccasin will be the Macintosh standard for everyone from home users to the biggest corporations.

• Open licensing has arrived. Many Apple executives have long realized that only by completely opening Mac OS licensing—selling the system to virtually all takers—could they stimulate a burgeoning clone market. Moccasin will enable this step because it decouples the Mac OS from Mac hardware, while retaining key Mac hardware features. This frees Apple from the predicament it now faces with the first Mac clones: supporting and selling parts to clone makers, and working with Macintosh parts suppliers to do likewise, is a costly, complex distraction from Apple's core business. Also, having to work with a distracted Apple is a serious bottleneck for clone makers.

BY CHARLES PILLER

PAUL FRANZ-MOORE

FIRST LOOK AT THE MAC'S FUTURE

• Apple, IBM, and Motorola are giving away their platform. To pump up the Moccasin market, they will offer royalty-free licenses for suppliers of converged-platform chip sets and system developers alike. (Apple will also keep its OS licensing fees competitive with Windows pricing.) Where will the three partners make their money? From selling their own Moccasin-based computers, from applications

This move enables cloning. You can now have multiple suppliers for the hardware—that's the key thing.

JIM GABLE, Apple's Power Macintosh product-line manager

and peripherals for the Moccasin market, and from royalties on the PowerPC chip itself. And Apple and IBM hope to make money selling the Mac and OS/2 operating systems, respectively, and regular updates. Motorola and IBM also hope to supply many of the core chip sets. The three companies realize that they must maximize acceptance of the new platform by bringing in as many licensees as possible. It's the only way to compete with Intel-based machines in the long run.

Open licensing of the new platform and the Mac OS means that any company can build Mac-compatible computers from inexpensive, off-the-shelf parts and sell into any market or geographic region. This will let Moccasin-based Mac-compatibles compete on a cost basis with their Intel-based counterparts. "The goal is . . . to fit into the existing structures for building commodity parts, yet keep performance very high," says Carl Stoltze, vice president for marketing at Motorola Computer Group.

"This move enables cloning. You can now have multiple suppliers for the hardware—that's the key thing," says Jim Gable, Apple's Power Macintosh product-line manager.

The only barrier to a complete separation of the Mac OS from hardware will be the Mac ROM. Although inflexible (ROM cannot be altered), the ROM-based Mac OS offers two key advantages over other OSs, all of which are completely RAM-based: ROM chips cost less than RAM equivalents, and the Mac ROM allows users to start up a sad Mac from a floppy and then run most features of most applications. (You can't do that with Windows or OS/2.) So at least the first version of Moccasin will require a slot for Mac ROM.

Full Compatibility Predicted

This integration of the Mac ROM reflects a design approach based on folding all essential components from the Power Mac platform—including the ADB input-device bus, and Mac-style serial ports with GeoPort capabilities and LocalTalk support—into IBM's PowerPC Reference Platform, or PReP (see the diagram "The Anatomy of PC/Mac Convergence"). In some cases—including the I/O controller and the combined memory and PCI (Peripheral Component Interconnect) bus controller—this integration requires completely new application-specif-

ic integrated circuits (ASICs) to accommodate both PC and Mac hardware requirements.

IBM and Apple say that this approach should mean that Moccasin will support nearly flawless backward compatibility for all the applications and peripherals of the OSs that will run on it. Such claims are plausible, at least for the Mac OS, for two basic reasons. First, the PowerPC processor family, the basis of Power Macs, will be the core of Moccasin. Apple made the most difficult compatibility transition last year, when it graduated from its old 680X0-series processors. Second, by this summer, long before it builds Macs based on Moccasin, Apple will have cleared the next-highest hurdle—the transition from NuBus to the PCI bus.

"For someone already owning a Mac, this model almost doesn't deserve the term *transition*. It'll be just like the next Power Macintosh model," says Gable. Many PC users will see the same effect, since Moccasin will also support the common PC hardware standards and will support OS/2 and Windows NT.

Tangible Benefits

The Moccasin approach gives Macintosh users, Apple, and Mac clone makers significant benefits.

Flexibility Moccasin-based Macs may seem nearly the same as their predecessors to most users, but one feature will distinguish them from any previous mainstream PC—*open firmware*, a specification that permits you to keep two, three, or even half a dozen operating systems on a hard drive; then when you start up, you pick which one you want to use. The Mac OS, OS/2, Windows NT, Solaris, NetWare, and AIX will all be ported to Moccasin. Intel-based systems also support numerous OSs but only let one system be installed at a time (with the exception that OS/2 and DOS/Windows can be loaded on the same hard drive and the OS can be selected at start-up). Apple also plans to offer standard Windows and DOS support as it now does: through add-on cards and emulation.

Eventually, IBM and Apple intend to produce computers that can switch between OSs without restarting. These systems would put the first OS into a sleep mode that protects all preferences, application states, and documents by saving them to the hard drive, then activates the second OS. Such a system—and a more advanced design that could

WILLIAM MERCER MCLEOD

allow simultaneous operation of more than one OS—will not be implemented in first-generation Moccasin machines.

Why is the ability to run multiple OSs appealing? Not many people outside of MIS directors, technology fetishists, and their ilk are likely to exercise the option. The reason has to do with hardware maintenance and staff training: relying on a single hardware standard for several OSs means less training for a technical-support team and end users, and fewer idiosyncrasies and unique problems to work through.

Moreover, if a company shifts resources—say, pares back its engineering staff but hires more graphic designers—rather than dumping Sun workstations and buying Macs, it could simply drop the Mac OS and ROM into the former engineering machines.

Most important, open firmware makes PCI add-in cards OS-independent—a capability that Intel-based PCs do not support. This will let companies standardize on, say, one kind of network interface card, regardless of which OS is loaded—saving both money and MIS-support time in the process.

Interoperability Guarantees Although spawned by the original IBM PC, Intel-based clones have frustrated many users because IBM neither owned its own OS nor had the power to require clone makers to adhere to basic hardware standards. The result: a sometimes chaotic assemblage of systems and peripherals that compares poorly with the Mac's plug-and-play ease of use.

As an OS-independent design, Moccasin should become the first fully unified standard in PC history—bridging gaps between Macs and PCs, multiple OSs, and peripheral devices. Interoperability and basic functions will be, in effect, guaranteed by Apple, IBM, and Motorola's license to the system maker.

Economies of Scale Standardization should help Apple achieve a fundamental goal: hooking corporate buyers. More than anything, Moccasin is Apple's final charge at enterprise computing.

Just as training and support can be complex and costly for a company that relies on a range of OSs, companies with cross-platform environments now pay dearly for dealing in relatively small unit volumes from a small number of suppliers. After shopping among a wide range of vendors, those buyers should realize steep volume discounts by purchasing nearly all computers from a single source, then plugging in whatever supported OS is required by each end user.

Those kinds of discounts will eventually filter down to add-ons; both Apple's Gable and Gary Griffiths, director of business development for IBM's Power Personal Systems, expect all the OSs ported to Moccasin to eventually take advantage of all Mac and PC peripheral-connection schemes. Thus OS/2

The Anatomy of PC/Mac Convergence

The converged hardware reference platform (code-named Moccasin) will add key Macintosh components to the PowerPC Reference Platform (PReP) developed by IBM. This artist's concept shows the basic parameters of the new design, which is still being developed and will be published this spring. It highlights contributions from Apple's Power Macintosh design and new chips to be created for Moccasin. Mac contributions include the Mac ROM slot, ADB, auto-eject floppy drive, and Mac-style serial ports for GeoPort and LocalTalk.
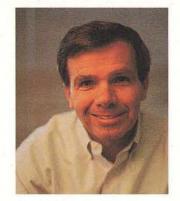
Moccasin will be designed for flexibility. Even standard features will be implemented in a variety of ways, depending on each system developer's strategy. RAM could be soldered onto the motherboard or added exclusively via slots. Likewise, PCI could be mounted onboard or implemented via slots. Moccasin will support ISA, NuBus, and SCSI expansion buses, plus IDE drives, all accessed via PCI; but not all developers will include them in their designs. Apple will probably support both IDE and SCSI; ISA support is being debated.

Derived from Mac
Unique to Moccasin

- SCSI/IDE connector
- VRAM slots
- Soldered VRAM
- **Mac video connector**
- VGA connector
- Soldered DRAM
- PowerPC 603, 604, or 620
- Cache
- **Mac ROM slot**
- DRAM slots
- Floppy connector
- SCSI/IDE connector
- **Memory and PCI controller**
- **NuBus (or ISA) controller**
- PCI slots
- **NuBus (or ISA) slots**
- **Combo Mac/PC I/O controller**

- Ethernet
- **GeoPort**
- **LocalTalk**
- **ADB**
- Audio I/O

might support ADB, while PC video vendors could take advantage of the Digital Audio Video (DAV) slot that Apple is adding to some of its forthcoming PCI Power Macs. (Ironically, in the process, the Mac's historic ease-of-use advantage vis-à-vis hardware would almost certainly evaporate, since Apple's hardware will be everyone's hardware.) Neither Gable nor Griffiths wants to see ports become ded-

The goal is a system that is

neither a PC nor a Macintosh, but one that combines the best of both

GARY GRIFFITHS, director of business development, IBM's Power Personal Systems

icated to a single OS, since that would effectively segment the market based on the connectors installed and keep the common platform from being common.

Bigger Pie, More Products Apple and IBM realize that only a large market based on a unified platform can challenge Intel-Microsoft supremacy. Macintosh users have watched with dismay as, over the last two years, many formerly Mac-centric developers either released Windows versions of their products before equivalent Mac versions or moved most of their efforts to Windows. Many developers feel they have no choice but to develop for the platform that holds some 80 percent of the personal computer market. This exodus from the Mac is already choking off diversity in some Mac software and peripherals categories. Unchecked, it could strangle the Mac, as happened with other innovative PC alternatives, such as Amiga and Next.

Some analysts say that Apple and IBM can mount a successful challenge to Windows only by choosing a single OS to run on their new platform—a move neither company is prepared to take. The critics might be right, but Apple is betting that the converged platform and Mac OS licensing will woo back wayward developers and bring in new ones who see a Moccasin-based market becoming far larger than the combination of Power Macs and whatever PReP-based systems ultimately emerge.

If Apple is correct, the Mac market will come to resemble the PC market both in its vast range of system and peripheral options and in the buying channels available to companies and home users alike.

Glen Miranker, vice president of FirePower Systems, a PReP system-board maker that is expected to become a leading producer of Moccasin-based systems, puts it this way: "As spectacular a job as Apple has done over the years, an *industry* delivers better products than a single company."

Major Challenges

Moving from today's Power Macs to tomorrow's Moccasin system presents several difficult challenges for Apple to overcome. The promise of a converged platform is great, but the effort will be daunting.

Creating the Design Will the transition to Moccasin be smooth and rapid enough to begin to crack the Intel-Microsoft edifice before it becomes impenetrable? After all, Intel (despite the odd chip scan-

dal) and Microsoft (despite legendary shipping delays) are hardly standing still. Apple's Gable argues that although the Mac differs significantly from Intel PCs, "the [technologies] that were gratuitously different have been wrung out of the Mac in recent years. PCs and Macs are not as exotically different than they were four years ago."

For example, NuBus served the Mac well because it was plug-and-play, in contrast to the standard PC buses, ISA and EISA, which were "plug-and-play nightmares," says Gable. But expansion cards using the new PC bus standard, PCI, will soon also be the Mac standard. "Now with PCI, you can have Macintosh plug-and-play" and still use the same bus as the rest of the PC industry, Gable adds. Other Mac features, such as the auto-eject floppy drive, will become standard on the new platform, while Apple eliminated auto inject on recent Mac models.

Macs and PCs have begun to overlap in several other areas. SCSI has become fairly common among higher-end PCs, and Apple has begun using the standard PC IDE (Integrated Drive Electronics) drives for internal hard drives in some recent Macs. The Mac's serial connectors may have a different shape than a PC's, but serial devices like fax modems work on either computer with the right adapter installed. Ditto for monitors.

"In areas where there are likely conflicts, we will either choose one method or accommodate both options," according to IBM's Griffiths. "For things like the memory map, which are more fundamental to the design, it was decided that it was better to accommodate both. The goal is to have a system that is neither a PC nor a Macintosh, but one that combines the best qualities of both."

This accommodation can be a laborious process. "We've literally had to take Verilog microcode [which defines basic chip functions] from Apple ASICs and combine it with Verilog code from IBM chips and create completely new chips," says Gable. Refining the Moccasin design and developing the ASICs and device drivers will take several months at least. Moreover, the crucial notebook and server aspects of the Moccasin design lag six to nine months behind the desktop version. Every month that passes serves Intel and Microsoft's feverish efforts to refine their own technologies.

Moving the Mac OS Even so, Apple faces a larger

hurdle: porting the Mac OS to the new platform. Unlike Windows NT, the Mac OS is not based on a *microkernel*—a design in which modular core services are kept separate from the hardware the system runs on. For example, to an application program running on top of a kernel-based OS, the I/O interface would appear the same on an Intel-based machine, a Power Mac, and eventually a Moccasin-based computer. The I/O kernel accommodates interpretations for each hardware platform. The value of microkernels has become clear because the major OS developers are jumping on the bandwagon. Apple's next major OS revision, code-named Copland, will implement a microkernel. Meanwhile, IBM is working on microkernel-based successors to OS/2 and AIX, as is SunSoft for Solaris. The only major OS not moving to the microkernel approach is Windows 95.

Moreover, the Mac OS was deliberately designed to be as tightly integrated with Mac hardware as possible—partly to enhance reliability and performance, partly to frustrate would-be clone makers considering efforts to reverse-engineer the Mac. Therefore, the Mac OS will probably be the last of the announced OSs to be ported to Moccasin (Apple estimates it will happen in late 1996), with the first Mac OS–based machines following as much as a year behind those based on other OSs. That delay could cost Apple a critical jump on the emerging market.

Maintaining a Unique Mac Once the transition has been completed, Apple—and other Moccasin developers who license the Mac OS—won't face much of a challenge from other OSs, such as OS/2 and Windows NT, that will operate on Moccasin. Of those OSs, the Mac OS is now the only mainstream system. Of course, if OS/2 Warp gains in popularity and if Windows NT is accepted outside of the engineering and server markets, the Mac OS may then have serious competition. The "outside" competition will be Windows 95 machines. The most intense competition will be from Moccasin clones using the Mac OS (see "Competing Against Clones").

Chances for Success

As the Newton experience, for one, so painfully shows, Apple is not always the most reliable prognosticator of sales totals. How likely is Moccasin to increase the Mac OS market share and thereby ensure its future, whoever makes the box itself? Several key factors look auspicious.

Working Together Apple, IBM, and Motorola showed that they can cooperate effectively in the development of the PowerPC chip—a good sign for Moccasin's technical development. And they have reached some sensible conclusions about how to structure the business side of Moccasin, particularly royalty-free licensing and the plan to select most parts from standard PC inventories. Those moves should keep manufacturing costs and consumer prices competitive.

Clear Standards As with any diverse market,

FirePower: First Converged-Platform Maker?

WHEN APPLE, IBM, AND MOTOROLA introduced their converged platform last November, an obscure, small company called FirePower Systems took a surprisingly prominent role in the proceedings. FirePower executives confidently predicted that they would ship converged platform–based computers within 90 days of when the platform specification is published sometime this spring.

The Menlo Park, California, start-up has only 70 employees, but it's already making a big impact in the industry developed around PowerPC microprocessors, and it may play a key role in making the converged platform, code-named Moccasin, a success.

Although small, FirePower is a major developer of system boards and complete systems for IBM's PowerPC Reference Platform (PReP)—the design Apple rejected in favor of Moccasin. FirePower sells systems only to other computer companies, which resell them under their brand name.

"FirePower has been very active in defining the PReP specification," says Gary Griffiths, director of business development for IBM's Power Personal Systems. "However, when they went to do their own PReP product, they chose not to use a chip set from either IBM or Motorola, but went to their own chip set that was compliant with the standard but better for their purposes."

FirePower should likewise be a key player in helping to refine the converged platform. The company expects to follow its PReP approach with a Moccasin-based machine—developing its own chips that conform to the specification but that also fit the specialized needs of its customers.

Also, as it has done in its PReP development, FirePower will avoid the PowerPC 601 CPU and instead move directly to 603- or 604-based Moccasin systems. Because those systems will be among the first on

the market, FirePower could have significant influence on other system designers.

FirePower can move so quickly, in part, because its experience with PReP—which forms the basis of many aspects of Moccasin—has given it a running start. "We're doing our development work while the converged spec is under development," says Glen Miranker, FirePower's vice president for hardware engineering. And FirePower's

current systems already use the PCI bus and open firmware—two key design elements of Moccasin. It also helps that the small company has deep pockets courtesy of its big partner, Japan's Canon.

GLEN MIRANKER, vice president for hardware engineering at FirePower Systems (left), and JON RUBINSTEIN, chief operating officer, both came out of top hardware jobs at Next Computer.

Within about a year after FirePower's first systems become available to developers, look for Moccasin-based systems to emerge from IBM, Motorola, Power Computing, and Apple, among others. Miranker welcomes the competition as a way to establish the platform as a serious standard. "All of the participants in this business are counting on being fellow travelers in a very large business," he said.

Competing Against Clones

HOW WILL APPLE HANDLE THE "inside" competition—Moccasin vendors licensing the Mac OS for their systems? Could Apple get lost in its own rush? How will it maintain enough distinct qualities to avoid being overwhelmed by the industry it created?

"Apple will be the standard that people compare any Mac to, of course, but what we're seeing already with people coming out with Macintosh-compatible machines, is that everyone is trying to distinguish themselves from Apple," says Apple's Jim Gable.

To a degree, Gable is undoubtedly right. The Moccasin/Mac OS market will probably replicate the rapidly evolving Mac-clone market of today, which is itself no more than a bridge to the converged plat-

form. Specialty players, like Radius, will probably provide turnkey solutions for video and authoring. Power Computing may use its current Mac-clone business to jump-start an effort to become a mail-order Mac titan, the way Dell did in the PC market.

But the converged platform will make it economically feasible—perhaps irresistible—for the largest computer makers to go head-to-head against Apple. The Mac OS market could grow considerably without much guarantee that Apple will grow its own share of computer sales. The Mac could succeed as a platform without enriching Apple, but Apple will still have to find the resources to pay for future Mac OS development.

expect some junk among Moccasin-based computers; but the licensing agreement will require developers to keep incompatibilities to a minimum. Meanwhile, Mac consumers will benefit from the innovations of a wide range of system makers.

The 32-Bit Edge Moccasin holds what may prove to be a key advantage over Windows machines. All the OSs that will run native on Moccasin process information in 32-bit chunks, rather than 16-bit chunks as Windows 3.1 does. But Windows users will make the 32-bit transition with either Windows 95 or Windows NT, and this transition could present problems for Windows users.

Incompatibilities will probably crop up with drivers and programs that rely on low-level system calls rather than high-level hooks into OS components like the Graphical Device Interface, the Windows equivalent of QuickDraw. Windows 95 has been delayed, in part, to avoid such problems, which are stunningly diverse given the vast array of Windows-based peripherals and applications. Significant incompatibilities could require users to replace software and even some peripherals. The first version of Windows NT was hobbled in part because it could not provide sufficient compatibility with many standard Windows drivers. Apple hopes that a Moccasin-based machine with Mac and PC capabilities will appeal to some Windows users, especially if Microsoft botches its Windows 95 rollout.

Selling to Strength Apple would like to sell many more computers, and it will, no doubt, market its

machines aggressively. But Apple's Moccasin strategy probably need not depend on selling many more of its own computers. Apple may instead be contemplating a software and peripheral strategy.

In the past, Apple was often first with new developments—from the graphical user interface to QuickTime—that led the entire PC industry. Consider how the Power Macs have left IBM, which has yet to release mainstream PowerPC-based systems, in the dust. Consistent with that pattern, look for Apple to service the converged platform with new technology, particularly in its historic strongholds and where it still arguably holds a technology lead over Windows machines: AV and multimedia; color publishing; plug-and-play peripherals; object technology and component software; device-independent, Newton-like personal-digital-assistant software; and if it doesn't lose the initiative to Microsoft, OS ease of use.

Apple could become the first among equals in an effort to make Moccasin not only the most flexible and reliable mainstream PC platform, but also the most advanced. It could sell a respectable number of Macs—perhaps at or slightly above its current market share—then make its real money selling software, peripherals, and incremental system enhancements to the entire Moccasin-based industry. You can see a glimmer of this in the strong sales of Apple's Imaging Division, which today sells printers, monitors, and scanners to both Mac and PC users.

Look for Apple to come out with an array of PCI cards and to extend its monitor, printer, and scanner lines in two stages—first, after PCI Macs come out, later this year, then when Moccasin-based Macs become available. And don't be surprised when Apple eats some of its young. If the Mac OS market becomes big and entrenched, expect to see Apple cannibalize profitable, high-end market segments. For example, if Radius develops a successful clone for video editors and multimedia producers, Apple might sell AV workstations bundled with RAID systems, just as it squeezed out all significant licensed competitors in the accelerator market last year by offering cheap PowerPC upgrades.

The Last Word

IBM and Motorola are staking a great deal on the converged platform; Apple is betting its life. But it's a good bet for the Macintosh user. Apple executives probably suffer from nightmares of their company drained dry in a war against cutthroat, cut-rate clone makers—a kind of Frankenstein-Mac effect. Yet even in that worst case, Apple should survive as long as it remains the sole or primary innovator for the Mac OS. If Apple stumbles in a big way, it will have no choice but to seek help in developing the Mac OS to ensure its survival. Either way, if the converged platform succeeds, the Mac OS should thrive.

Moccasin will mean that eventually it won't much matter whom you buy your Mac from. For the Mac consumer, tied to Apple for all these years, for better or worse, richer or poorer, this is a divorce made in heaven. ◨

Meeting the
E-Mail
Challenge

BY JOEL SNYDER

Electronic mail has wedged itself firmly into the consciousness of most Mac users. The easily realized benefits of internal electronic communications sent E-mail into the limelight, while the potential for fast and easy communication with the rest of the world over the Internet added a million watts of bright white spotlight.

The goal of having an organization-wide E-mail system bring easy communications to everybody's desktop looks good in a strategic plan, but network managers charged with making it happen have their hands full. Building large E-mail systems often involves making separate systems interoperate, share directory information, and work across different platforms.

I looked at the problems companies have in building large E-mail networks and the software tools that are available to solve them. The news is good: large E-mail networks that work well are possible. By finding the right software tools, spending time planning, and making a few compromises, network managers can build enormous networks that work.

Challenge One

SCALABILITY

Ask most organizations about their Mac-based E-mail, and you're likely to hear about CE Software's QuickMail (100

users $4749; 515/221-1801), Lotus Development Corporation's cc:Mail (server software $95, 100 users $4760; 415/961-8800), and Microsoft Mail (server software $269, 100 users $3659 estimated retail price; 206/882-8080). According to the market-research firm International Data Corporation, this trio accounts for more than 6 million mailboxes on PCs and Macs. The three packages use a similar paradigm for electronic mail. A client user on a Mac or PC connects to a server (called a post office or mail center) to retrieve, send, and file electronic mail.

End users of these applications appreciate the interfaces that make organizing mail and sending documents simple. Training costs are low, but experienced users may find these interfaces limiting.

Network managers aren't so happy with the server side of the LAN-based E-mail equation. Mac and PC E-mail systems are designed for small networks with only a few users. Once the mailbox count jumps to 500, let alone 5000 or 50,000, most products begin to break down.

E-mail is a disk-intensive and network-intensive application. An E-mail user can easily send and receive 20 to 100 messages a day. Multiply that by a couple hundred users, and you'll never get a single AppleShare server to handle the kind of load E-mail demands. Apple's high-speed servers, such as the Apple Workgroup Server 8150, just can't move more than about 500 kilobytes per second through the Macintosh Operating System, the AppleShare software, and the AppleTalk protocol stacks.
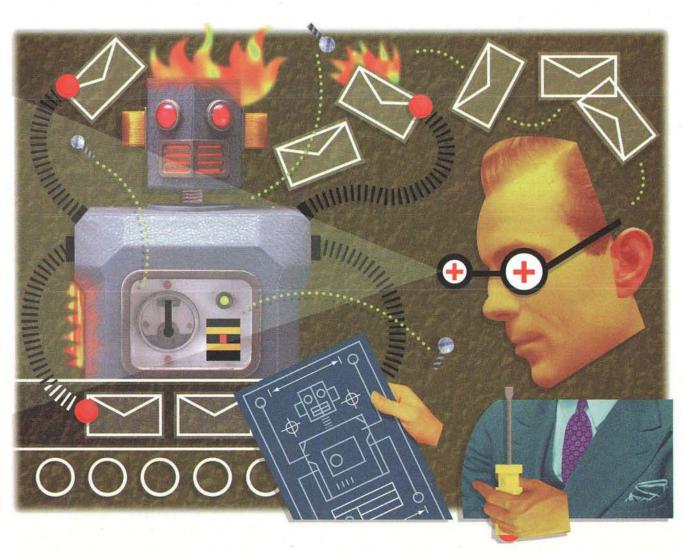
For realistic response time, even high-speed servers should be limited to between 20 and 150 active E-mail users—

fewer if you use E-mail to move large files around. If you've got an active user community larger than that, plan for multiple servers now. Don't try to save money on your server—this is one place where speed really does count. For best results, choose an Apple Workgroup Server with two SCSI buses and install the RAID software that comes with the server, spreading the load across the two buses. In my tests using Apple RAID in dual-SCSI configurations, E-mail server response time improved by between 9 and 12 percent. (For more information about RAID, see "The RAID Option," in this issue.)

These basic architectural limitations aren't the only things holding back performance. Although vendors use the terms *client* and *server*, this isn't true client-server computing: the E-mail server is typically little more than a file server, and the clients use it primarily as a shared storage medium. So instead of asking for and receiving a message (as would happen in a true client-server scenario), the steps involved in getting a message might be opening a directory, then reading the

directory, closing the directory, opening a file, reading the file, and closing the file. This puts a tremendous load on the file server, as it responds to low-level requests for disk services rather than high-level requests for E-mail messages.

File servers handling mail are also heavily stressed if you use your E-mail network to share files. To keep performance high, teach users to use shared disks on a file server or with System 7 file sharing, public folders, and folder protections—instead of E-mail—to distribute large documents. Also consider providing people who share large documents or who work on group projects, with alternatives to E-mail such as On Tech-

TOP STRATEGIES to ensure your E-mail system keeps up as your network grows

nology's Instant Update ($495; 617/374-1400) or Pacer Software's PacerForum ($549 for five users; 508/898-3300).

E-mail vendors use a not-really-client-server approach because the E-mail market demands it: vendors are writing for the personal-computer market, where a network of 20 workstations is much more common than a network of 200, and network managers prefer an E-mail server that sits easily on their existing Apple-Share server. This isn't some hidden truth. When I tested Microsoft Mail, cc:Mail, and QuickMail, the vendors gave me frank admissions about the capacity limits of their products. For tips on preparing for growth with each of these E-mail systems, see the sidebar "Tips for Growing E-Mail Networks."

Single–Post Office Approach Once you have more than a few hundred users in a single location, you can either increase the number of post offices (servers) or find software (not QuickMail, cc:Mail, or MS Mail) that can handle a single large post office. Although scaling up by adding post offices looks attractive—because it includes known servers, known clients, and existing practices—the cost for adding and maintaining many sites is higher than that for making the leap to a different E-mail system: a true client-server system costs less per user to own, manage, and operate. However, this cost shows up as one huge budget item rather than as lots of little budget items.

One way of stretching the single–post office option is to move out of the Apple-Share arena and into a faster, AppleTalk Filing Protocol (AFP)–compatible server. For example, Windows NT's built-in file server offers higher performance than AppleShare does on equivalent hardware. In fact, when it ships, the Microsoft Exchange Server, the next-generation server for MS Mail, will require a PC running NT Advanced Server (NTAS) 3.5.

Digital Equipment Corporation's (DEC) TeamLinks ($52 to $80 per user; 508/493-5111) client-server E-mail system is designed to support thousands of users, including Mac, Windows, DOS, dumb-terminal, and X window system users. The TeamLinks server, called Mailworks (starts at $930), runs on Unix and OpenVMS. Clients connect via DECnet, TCP/IP, or dial-in.

DEC plans to provide client-server access to LAN E-mail systems, such as cc:Mail and MS Mail, by letting existing clients plug into a Mailworks server. This would combine the advantages of a high-performance mail server with a familiar user-interface. Unfortunately, the Mac versions won't ship until later this year.

If you're considering using another

platform such as Unix for the server, check out Eudora, from Qualcomm (for 2 to 49 users $45; 619/587-1121), which has mail clients for Macs and Windows PCs. Eudora's automatic filtering and categorizing of incoming E-mail messages equals that of the most sophisticated filters of the Mac E-mail systems.

Multiple Post Offices In many cases, more than one post office (or server) is required. Geography, lack of resources, and an installed base of different mail systems are all factors that might necessitate a multiple–post office network. When many employees are spread across many locations, but no single location has more than a few hundred users, a single post office is not cost-effective.

If you must break up your network into multiple post offices, put as many users as possible on each to keep management costs down. When you need to link only one or two E-mail post offices from different kinds of E-mail systems, gateways can accomplish the task.

With the various gateways that are available you should be able to build a system that can link most Mac-based E-mail systems to each other. Many vendors—for example, Microsoft—sell gateways for their E-mail packages. But in my experience, third-party gateways—particularly those to SMTP mail—are more reliable, easier to manage, and offer better support than the gateways offered by the mail-package vendors. The reigning royals of the third-party, Mac E-mail–gateway business are StarNine Technologies (510/649-4949) and InterCon Systems Corporation (703/709-5500).

As the number of E-mail servers grows, gatewaying from post office to post office becomes a nightmare of configurations and customizations. If your E-mail network looks like it will ever have

more than three post offices, you should immediately begin to investigate an E-mail backbone. Unlike gateways, which require one-to-one connections between systems, every E-mail post office connects to the backbone directly, and all E-mail travels over the backbone.

Electronic-mail backbones are partic-

Comparing E-Mail Architectures

Number of Users	Post Office	Server Operating System	Type of E-Mail System	Cost per User	Scalability
10	single	Mac	file-based	low	low
100	single	Mac	file-based	low	low
	single	Windows NT	file-based	medium	medium
1000	multiple	Mac or other	file-based	medium	medium
	multiple	various	various file-based systems; gateways	high	low
	multiple	Mac or Windows NT	various file-based systems; backbone	medium	high
	single	Unix or VMS	client-server	medium	medium
10,000	multiple	Mac or Windows NT	various file-based systems; backbone	medium	high
	multiple	Unix or VMS	client-server; backbone	low	high

ularly useful when you need to link heterogeneous E-mail systems, because backbones solve not only scalability problems but also interoperability problems.

Challenge Two

INTEROPERABILITY
Very few large E-mail networks are composed of just Macintosh users. Large organizations tend to grow computing systems over time, and users are loath to give up what they're used to. This means that a network manager trying to build an organization-wide E-mail system may have to link E-mail from minicomputers and mainframes. Even if the plethora of mainframes have been banished to computing purgatory, the problem of multiple personal computer E-mail systems often raises its ugly head: any site with thousands of users has streams of parallel evolution that guarantee the need to link personal computer systems.

Add to this mixture some links to the outside world of the Internet, X.400, and other public E-mail systems, and you'll find that interoperability is more difficult than E-mail vendors make it sound.

Building a Backbone To build an E-mail backbone, you need to find a backbone that can connect to all of your E-mail post offices.

Mac network managers won't be happy to hear that the core software from backbone vendors requires a Unix or OpenVMS minicomputer. However, minicomputers offer advantages. Because

these platforms run multitasking operating systems, a good backbone won't have to stop all E-mail to deal with a long or complex message. Backbones are responsible for document conversion between different E-mail systems, a task best done in the background. Also, only minicomputer backbones provide in-depth logging

Compatibility with Other E-Mail Systems	Installation	Management	Performance	Comments
low	easy	easy	high	Easy way to start.
low	easy	easy	low	Barrier to growth.
low	average	average	high	Management somewhat difficult.
low	easy	average	low	Total cost high but hidden.
medium	difficult	average	medium	Significant barrier to growth.
high	average	difficult	medium	Good with Internet, X.400, and fax links.
low	average	average	high	Easiest directory services for this net size.
high	average	difficult	medium	Workgroup managers control local networks.
medium	average	average	high	Typically single-vendor solution.

facilities that allow you to trace a message's path through a system step-by-step.

The following are the leading companies' personal computer E-mail backbone products, along with entry-level prices: Alisa Systems' AlisaMail (from $10,000; 818/792-9474), The Boston Software Works' InterOffice (from $4500; 617/482-9898), Control Data System's MailHub (from $20,500; 612/482-6736), Hewlett-Packard's OpenMail (from $144 per user; 800/637-7740), Innosoft's PMDF (from $6000; 818/919-3600), Wingra's Missive (from $6000; 608/238-4454). All of these vendors support MS Mail and SMTP. All except Control Data support cc:Mail. Only Alisa Systems and The Boston Software Works support QuickMail. Most of the vendors support X.400 and Novell MHS.

Choosing a backbone vendor can be treacherous and expensive. The lists of features, platforms, restrictions, and options are complex and confusing. Each product takes a slightly different approach to moving E-mail into the backbone. Little features such as document conversion can turn into major stumbling blocks if the software doesn't support the document types you need. For more about finding the package that is right for you, see the sidebar "Picking a Backbone."

In my experience, E-mail backbone products from Alisa, DEC, and Innosoft provide the best management and user interfaces and the greatest compatibility with a wide range of E-mail systems.

Challenge Three

DIRECTORY SERVICES

One benefit of an electronic-mail system is a unified directory of users, but managing E-mail addresses is a problem when multiple E-mail systems are involved. Microsoft, CE Software, and Lotus all support directory synchronization for their own post offices but don't give you any help with a heterogeneous environment. If you insist on having one organization-wide E-mail directory, be prepared to spend time and money to run it.

One mistake many organizations make is trying to make E-mail addressing as simple as knowing a person's name. As the number of E-mail users grows, this scheme backfires because names are not enough to uniquely identify individuals. To avoid this problem, add location-specific information to E-mail addresses.

Resist the temptation to attempt to include the corporate power structure in your E-mail addresses. If a dozen departments all coexist on the same E-mail server, assigning addresses based on who works for which department is unnecessary micromanagement—and is likely to cause mishaps and waste time while network managers try to keep up with the fluid movement of people and names.

Another approach to directory coordination is to simply ignore the problem and not support a unified E-mail directory. Organizations with a decentralized structure, such as most universities, have taken this tack and ignored E-mail directories or maintained them on paper or in a separate, uncoordinated database. In companies where users don't need coddling and can handle a few bounced E-mail messages, this is cost-effective. Directoryless E-mail is also good preparation for interaction with the Internet, where directories are few and far between.

TIPS FOR GROWING E-MAIL NETWORKS

CE Software QuickMail

- Assign each department to its own mail center, but consolidate multiple mail centers on a single mail server to keep the number of users at around 250 per server.
- The ideal QuickMail server is a Quadra 800 or 900 system that has lots of disk space and is running System 7. QuickMail doesn't run on A/UX-based servers and won't run on Power Macs until the networking system software runs natively, according to CE Software.
- The biggest problem in large QuickMail networks is the surfeit of mail that users don't delete from the server. QuickMail has no automated archiving tools, so you need to keep a close eye on disk space and train users to delete or move mail once they've read it.
- For best directory synchronization, use StarNine Technologies' MailLink Directory Services ($2995).

Lotus cc:Mail

- Read the company's *cc:Mail Router Administrator's Manual*, which is the best document on building cc:Mail networks of any size. cc:mail Router ($95) is the add-on software required for a multiple–post office network.
- Don't use peer-to-peer communications; establish a central cc:Mail router and post office to poll the other post offices.
- Keep post offices at around 150 users, certainly no more.
- OS/2 reliability has greatly improved; use OS/2 to run multisession cc:Mail Router and cc:Mail Mobile for Mac ($195, add-on software for remote users).
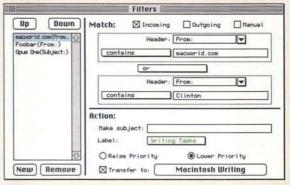
Microsoft Mail

- A Windows NT post office on a fast server can handle about 200 users, no more.
- MS Mail on a Macintosh server has a much nicer user interface than on a PC server, but Microsoft will not upgrade the Mac server. Use the uglier but speedier PC-server version for a large network.
- Microsoft no longer offers any free phone support for its advanced-system products. Check in often with its fax-back service (800/936-4400) and CompuServe forum to pick up bug-fixes and updates.
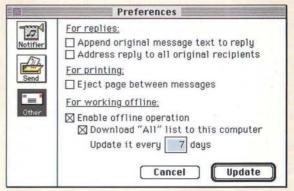
Any Mail System

- When you install client software, you should make it as easy as possible to update it later via electronic software distribution, remote-management software (such as Farallon's Tim-

buktu Pro, $199; 510/814-5000), or Apple events.
- Use remote-management software to manage servers.
- Watch distribution lists, which can eat up your network if they're misused.
- Preconfigure clients to delete the text of the original message in replies as a default. Use ResEdit if you have to.
- If you have an Internet connection, provide alternatives (such as a conferencing system like Pacer Software's PacerForum) for users to read Internet-based mailing lists. Otherwise, you could end up with 20 copies of the same mailing list sending 1000 messages a day into your E-mail system.

Filter Messages   Qualcomm's Eudora lets you filter messages based on header content, such as the sender's address.

Less Text, Less Traffic   To cut down on the size of messages, preconfigure clients to delete the text of the original message in replies. To do this in Microsoft Mail, uncheck "append original message text to reply" under preferences.

Building a single directory across heterogeneous E-mail systems requires software to collect and reconcile directory information. Most E-mail backbone vendors include software and tools for maintaining a unified directory. For a backboneless environment or one where the backbone vendor doesn't support all your E-mail systems, use directory-synchronization software. StarNine Technologies offers Mac-based MailLink Directory Services ($2995). Hitachi Computer Products offers Unix-based SyncWare (starts at $4995; 408/986-9770).

If directories are important to you, insist on support for X.500, the ITU-T international standard for distributed directories. By storing your E-mail directory in an X.500-compatible format, you will easily be able to share it with the outside world when you link your organizational E-mail systems to the Internet or to a public X.400 E-mail network.

The Last Word

Building large, integrated E-mail systems requires planning with a corporate scope. It's equally important to set users' expectations early on. Large heterogeneous E-mail networks can be just as reliable and powerful as small systems if you pick the right E-mail backbone partner. You

will find that some of the features of small networks, such as unified directory services and nearly instantaneous delivery of messages, may not be possible or desirable in larger networks. By planning and setting expectations, you can ease the growth into a true organization-wide E-mail system. m

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The leading RAID systems: MegaDrive's MR/5 RAID (left) and FWB's Sledge-Hammer2000FMF.

The RAID Option

MACWORLD LAB INVESTIGATES WHETHER RAID

DELIVERS ON ITS PROMISE OF FAST, SECURE STORAGE

BY MATTHEW LEEDS

Blinding speed or unrivaled data safety—RAID systems offer these promises. Speed for desktop video, editing or transferring giant Adobe Photoshop files, or searching massive databases; safety through instant ongoing protection of network storage or critical desktop data. We looked at 17 systems from 13 vendors to find out if RAID delivers on its promises. The answers we found surprised us, and they may surprise you. In many cases these highest of the high-end storage systems cost little more than standard storage solutions. But RAID is not always the right step, even for applications it was specifically designed around. For example, for desktop video, RAID may be a waste of money.

RAID stands for Redundant Array of Independent Disks. The original idea was to group relatively inexpensive drives as a single logical drive to achieve *fault-tolerant data redundancy*—the ability to recover data that would otherwise be lost by a failed drive—for less than the price of one comparable-size (large) hard drive. Originally five RAID configurations, levels 1 through 5, were defined. A newer version, *data striping*, or Level 0, offers some performance advantages over other RAID levels but no data redundancy—so technically it isn't actually RAID.

The basic components of a RAID system include two or more drives and RAID software. Most RAID systems also include one or more SCSI cards that improve on the performance of the Mac's built-in SCSI port. RAID 3 and 5 systems, usually intended for use on a server, often incorporate one or more *hot-swap* features—redundant power supplies, fans, or removable-drive trays that allow you to replace a failed drive (and reconstruct the data on the new drive) without shutting down the RAID system. (Among the drives we tested, the Mirror Precision 6, MegaDrive Systems MR/5 RAID, and Core International CoreArray 20000 included hot-swap features. Direct Connections, La Cie, and MegaDrive all offer an optional integrated tape drive for even greater security.)

Five of the systems we tested (La Cie's Joule RAID, Spin Peripherals' RAIDline1, APS's Arraid, MaxConcept's SW-4100R, and FWB's SledgeHammer-2000FMF) supply RAID features through software alone. The rest also include one or more SCSI-2 cards in either a Fast or Fast/Wide implementation (see "Vital Statistics on Tested RAID Systems"). SCSI-2 Fast cards increase the throughput of the Mac's native SCSI port (the fastest Macs support up to 5MB per second, except the 8100-series Power Macs, which have an internal SCSI-2 Fast port) to a top speed of 10 MBps, while SCSI-2 Fast/Wide cards also double the number of data lines on the SCSI port, increasing the top speed to 20 MBps.

RAID as a Commodity

Despite the expense and complexity of RAID—or perhaps because of it—many of the products we tested rely on the same hardware and software. The 13 companies supplied only 6 different applications. MegaDrive and Core each use their own special RAID software to support advanced hot-swap features. Optima Technology also bundles its own easy-to-use DiskArray RAID software, which offers impressive results. Optima's DisKovery 8200W running at Level 0 needed only 19 seconds to duplicate a 40MB file using the Finder, compared with about 29 seconds for a similar system, the Bottom Line Magic 4GB. Optima's DisKovery 8200W yielded substantially faster performance in all of the other tests as well. Both of these systems use two Fast/Wide SCSI-2 cards and two Seagate Fast/Wide drives that offer equivalent base performance.

Microtech International used version 2.0 of ExpressStripe from Atto Technology. ExpressStripe 3.0 did not ship before we completed testing, but 2.0 offered very good performance on most tests, though its interface was abysmal. For example, the list of partitions available for inclusion in an array appears in an obscure sequence of index numbers, not by volume name. We ran into serious problems with the Microtech systems on Photoshop tests—

discolored streaks on the screen and occasional crashes. This turned out to be caused by a bug in ExpressStripe 2.0 software. Atto says version 3.0 fixes the problem, and Microtech began supplying 3.0 shortly before we went to press.

FWB and Radius use FWB's RAID Toolkit, which is easy enough to install in an external array, such as the Radius Studio Array, but is painful to install in a dual-bus Macintosh. You must first install both drives on one bus to format them, then move one drive to the internal bus to set up the array. Of course, pain is a relative term, and nothing compares with communicating with the MegaDrive MR/5 and CoreArray 20000. For these you must use either a built-in LCD panel or a remote terminal session via telecommunications software.

The eight other systems use Remus software from Trillium Research (715/381-1900): either Remus Limited ($295), a version that supports only RAID 0 and 1, or the full version, which also provides RAID 4 and 5 ($590). If you already own two or more drives, this may be far cheaper than buying a prepackaged RAID system. Since the Remus software supports
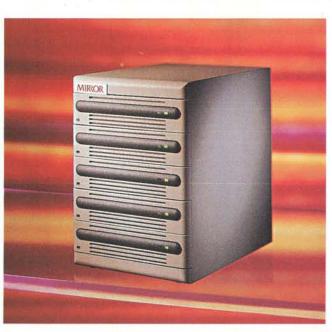
drives of different sizes, you can use just about any drives you have on hand. But without a SCSI-2 card and high-performance drives, you may not get the speed you're looking for.

We looked at ten systems that use SCSI cards—in all cases, either Atto's SiliconExpress IV or FWB's SCSI JackHammer. Unlike the FWB SledgeHammer2000FMF, which relies on software alone and is designed for Macs with dual SCSI buses, such as the Quadra 950 or Power Macintosh 8100, the FWB SledgeHammer4100FMF-W uses the JackHammer. Always verify that your vendor is shipping the latest firmware for the Atto card; using the current version should make a difference in performance and reliability. Both the FWB and Atto cards support SCSI-2 Fast and Fast/Wide.

WITHOUT A SCSI-2 CARD AND HIGH-PERFORMANCE DRIVES, YOU MAY NOT GET THE SPEED YOU'RE LOOKING FOR

Mirror's RAID systems, such as the Precision 6, feature unique slide-out trays that include both a drive mechanism and a power supply.

Key Performance Factors

To rank the RAID systems, the tests Macworld Lab used were searching a 4th Dimension database with nearly 100,000 records, opening and saving a 40MB Photoshop 3.0 TIFF file, and duplicating a 40MB file from the Finder (see "The Speed of RAID"). We also spot-checked an 80MB file duplication and ran a wide range of sustained-throughput tests. Although the data from those tests were too voluminous to show here, they validated the rankings shown in our benchmarks.

We ran special tests on three systems: the Mirror Precision 6, MegaDrive MR/5, and CoreArray 20000. Since these systems support one or more hot-swap features, we tested them by causing one of the drives in the array to fail and then adding a new drive and rebuilding the array. We also examined any additional hot-swap features.
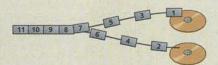
Ranking Configurations The testing established a few general principles to guide your considerations regarding hardware performance. All other factors being equal, RAID Level 0 arrays generally rank, from slowest to fastest, with the following bus connections: native Mac SCSI bus, dual native SCSI buses, one SCSI-2 Fast/Wide card (with Fast drives), one SCSI-2 Fast/Wide card (with Fast/Wide drives), and two SCSI-2 Fast/Wide cards (with Fast/Wide drives).

For example, compare the performance of the Spin Peripherals RAIDline1

DATA ■ PARITY INFORMATION ■

RAID 0 Sometimes called *data striping,* Level 0 combines two or more drives into a single logical drive. Data is written in segments to each drive in sequence. RAID 0 provides the fastest RAID systems, particularly when one or more of the drives use SCSI-2 cards. But the failure of any drive destroys the entire system's data.

LEVEL 0 Data split across two drives. Key factors: fast and affordable, but half as reliable as a single drive.

RAID 1 *Mirroring,* or Level 1 RAID, writes identical data to each drive in a pair. One drive in the mirrored pair can fail and you lose no data. You can avoid the performance penalty for this safety by using two SCSI-2 cards (on any Mac with at least two NuBus slots) and connecting each drive to a separate SCSI bus—a process known as *duplexing.* Level 1 data redundancy comes at a high cost, since you must have twice the storage space your data requires. (RAID levels 0 and 1 can be combined to gain both speed and security. Such combined systems are sometimes called RAID 10.)

To get around the need to store duplicate copies of data for redundancy,
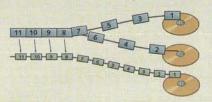
LEVEL 1 Duplicate data written to two drives. Key factors: slow, high cost per megabyte, but secure against data loss.

all other RAID levels use *parity data* (a form of error correction) to reconstruct data from a failed drive. By comparing the data on the remaining drives in the array to the parity data, the RAID system can re-create the data on the lost drive. This works like solving for a missing variable in an equation. (For example, $2 + 3 = 5$, where 2 and 3 represent data and 5 represents that data's parity information. Should the drive containing the 3 data fail, you could recalculate it in this fashion: $2 + x = 5$, so $x = 3$.)

RAID 2 RAID Level 2 is targeted at supercomputer applications; there are no RAID Level 2 implementations for the Macintosh.

RAID 3 RAID Level 3 retains a great deal of the performance of RAID 0, while reducing the high cost of data redundancy that is found in Level 1. RAID 3 requires a dedicated hardware controller

LEVEL 3 Parity information stored on a separate drive. Key factors: fast for large-file transfers, lower cost for data security.
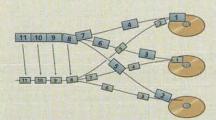
and a minimum of three drives with spin rates that can be synched. One drive is dedicated to containing parity data; the others are used to store data. The data is usually segmented at the byte level. All drives service a single read request, and all drives send their data to the controller in parallel. This offers high transfer rates for applications that move large files around—as is commonly done in prepress and video production. However, since all

drives are involved in every read or write, RAID Level 3 has a tendency to perform poorly in sequential input/output applications, such as transaction processing or database searches using extremely large files or when multiple clients access files simultaneously.

RAID 4 In an effort to solve RAID 3's problems with sequential I/O, Level 4 segments data at the block level rather than the byte level. This allows each drive to operate independently. RAID 4 improves read access but suffers from a write penalty since every write must access the parity drive.

RAID 5 By eliminating the dedicated parity drive, Level 5 solves sequential I/O performance for both reads and writes. Data and parity are interleaved among all drives such that the parity data for a given set of drives is stored on the remaining drive. RAID 5 has almost completely wiped out the use of RAID 4. But RAID 5 is not as fast as RAID 3 with large files during writes.

Using RAID 3 and 5 amortizes the price of data redundancy by sharing it across a larger number of drives. But the dedicated controller required by RAID 3 systems makes them costlier than RAID 5. Costs are made higher still by hot-swap features, which are required by most users of RAID levels 3 or 5.

LEVEL 5 Parity information distributed across all drives. Key factors: fast for small transactions and database lookups, lowest cost for data security.

system, which uses the native bus of the Power Macintosh 8100, with that of the FWB SledgeHammer2000FMF, which uses the dual native bus of the Power Macintosh 8100. Both use nearly identical DEC drives, but the FWB system shaved 8 seconds off the RAIDline1's 39-second performance on the duplicate test and was significantly faster overall.

The MegaDrive MR/5 setup in RAID Level 0 was the fastest overall system, taking the lead in the 4th Dimension and Photoshop tests. Part of its

advantage is due to its being the only system with a RAM cache—32MB in the unit we tested. It was slightly faster (except in the duplication test) than the two Optima systems, which delivered the next best overall performance, and were much more affordable. It's worth noting that only four systems cost less per gigabyte than the Optima DisKovery 8200W.

The La Cie Joule RAID and Direct Connections DC3400W also turned in noteworthy numbers. The Mirror Precision 6 and CoreArray 20000 performed

relatively poorly, but because they offer hot-swap capability they should not be judged on performance alone.

We gleaned two other hardware generalizations from the Macworld Lab tests. In a database environment, the most cost-effective solution combines a single SCSI-2 Fast or Fast/Wide card and one or more DEC DSP3210 drives. These drives use internal caches optimized for small-file access, and these drives excel in database searches and sorts. Of course if you need the protection of true redun-

dancy, you'll want to set up either a RAID 1 or RAID 5 system.

Video Reality Test   Many vendors say RAID excels at video capture. But because we requested that vendors send us generic systems that would be useful for a range of tasks, most products were not video-ready out of the box. Video capture requires setting drive parameters for things such as *prefetch size* and *buffer-full ratios*—low-level settings that most vendors pay little attention to.

Therefore, we tuned a cross section of the Level 0 drive and bus configurations to draw some overall conclusions about RAID video-capture performance. In general, we found that any properly configured RAID system—except a system relying on a single native NuBus (not using a SCSI-2 card) can capture digital video at acceptable rates.

If you are working in a desktop video environment with VHS or S-Video–quality equipment, you may not need RAID at all. Macworld Lab tests (confirmed in conversations with technical staff at Radius) show that a SCSI-2 Fast/Wide card and the latest Seagate ST12450W drive can provide the 4 to 4.5 MBps data-transfer rate needed for this kind of work—anything more is overkill and a waste of money. But if you're working in BetacamSP, your target is 5.5 to 6.5 MBps. For this, you still need an array.

We also found that all the dual SCSI card systems we tested (two from Optima and one from Bottom Line) conflict with the Radius VideoVision Studio (VVS) card. The issue is bus contention. The VVS and SCSI cards demand access to the NuBus simultaneously. So far no one has been able to get dual SCSI cards to work properly with a VVS card. A similar problem can also crop up with some third-party sound cards.

A new version of the Bart chip, used to control the NuBus in Power Macs, may hold the key to solving this problem. The Power Mac 8100/110 has this new chip, Bart 21, but we were unable to obtain one for testing in time for this article. The 8100/110 uses a slower system bus (36.7MHz) than the 8100/80 (40MHz); hence the overall NuBus transfer rate on an 8100/110 runs about 8 percent slower. (It's even slower on an 8100/100, which uses a 33.3MHz system bus.) The speed difference derives partly from the slower bus speed, partly from synchronization overhead, because the 10MHz NuBus clock speed does not evenly divide into the 8100/110's system bus speed. But the release of PCI versions of the PowerPC, VVS, and SCSI cards later this year will also solve this issue, in that NuBus and its conflicts will become a thing of the past.

As you consider these test results, remember that the RAID systems we tested are representative of what's currently on the market, but they are not the only offerings available. You can usually request specific components to meet your performance and budgetary needs.

Performance Bottlenecks   Also, take advertised performance specifications with a grain of salt. While some vendors state specific maximum-throughput figures, real-world performance, particular-

AV DRIVES: FRAME-DROPPING PROBLEM SOLVED

You're just finishing a digital-video edit of an astonishing event. Your RAID system's high throughput is giving you great picture quality. But you suddenly notice that a few critical frames—the ones that show the UFO— are missing. You've just discovered that sustained throughput isn't the same as uninterrupted throughput. Digital-video professionals need storage systems that don't temporarily stop processing data, thereby dropping frames.
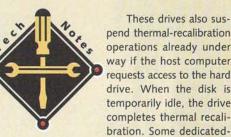
The problem is heat. As a hard drive generates heat, its platters and read-write armature expand at different rates. A drive must account for this expansion to ensure that the reading and writing heads remain aligned with the data tracks on the platters.

Many older drives briefly halt data flow every two to ten minutes to check and correct every head's alignment. This thermal recalibration can take 100 to 500 milliseconds, a delay that isn't noticeable in business and graphics applications that transfer data in small chunks. But for digital video, with its long continuous transfers, a pause could mean 3 to 15 dropped frames.

The solution is drives that smoothly adjust to heat. Manufacturers have two methods to correct for heat expansion without interrupting data flow.

One approach controls when recalibrations occur. *Dedicated-servo* drives use one side of one platter exclusively for all the drive's navigation data. When the dedicated platter's data head notices that the dedicated-servo data has shifted because of expansion, the data head adjusts the positioning of all the read and write heads on all the drive's other platters.

Since dedicated-servo drives must perform thermal recalibrations, companies that use them, such as Micropolis and Seagate, have developed systems that postpone recalibration while data is being written or read.

These drives also suspend thermal-recalibration operations already under way if the host computer requests access to the hard drive. When the disk is temporarily idle, the drive completes thermal recalibration. Some dedicated-servo drives recalibrate only one head at a time. These drives never need more than a few scattered pauses in data flow to completely adjust for expansion.

The other method to ensure constant data flow is to eliminate thermal recalibrations altogether. Companies such as Quantum, IBM, Conner Peripherals, and DEC offer high-capacity drives that use *embedded-servo* technology—servo and user data are interleaved on both sides of every platter. The same head accesses both servo and user information, continually repositioning itself for temperature changes.

Macworld Lab found that arrays built with either embedded-servo or dedicated-servo drives could capture video without dropping frames.

Macworld Lab also captured video to a three-year-old 500MB Seagate ST1581 hard drive at its QuickTime data limit of 1.5 MBps. During 45 minutes of close observation, we found six instances of dropped frames, most likely due to thermal recalibration. But we had to concentrate to notice the disruptions—which suggests that thermal recalibration was never quite the problem some drive vendors have suggested.

While some older drives may create more glaring errors, the video the ST1581 produced would be fine for most corporate use—though broadcast video editors would complain.

So finding a drive without intrusive thermal recalibration is no longer a problem. Many vendors clearly indicate which of their drives are AV or multimedia ready. When shopping for a digital-video RAID system, first ensure that the drives don't drop frames and then look for high throughput.—**Jim Feeley**
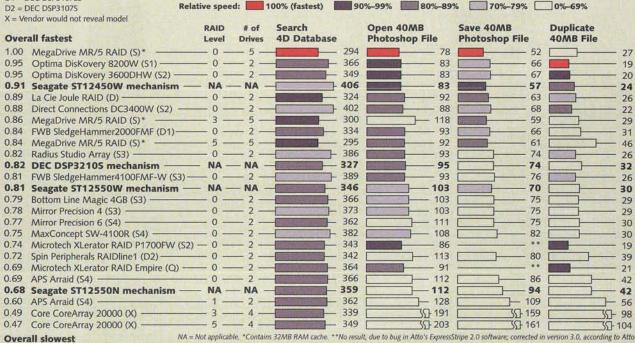
The Speed of RAID

Mechanism key:
S = Seagate ST11950N
S1 = Seagate ST15150W
S2 = Seagate ST12450W
S3 = Seagate ST12550W
S4 = Seagate ST12550N
Q = Quantum Empire 1080S
D = DEC DSP3210S
D1 = DEC DSP3107LS
D2 = DEC DSP3107S
X = Vendor would not reveal model

The RAID systems are listed from fastest (top) to slowest (bottom). Some systems appear more than once, for different RAID levels tested. To determine rankings, Macworld Lab indexed the combined test results against the fastest system in each test. Thus, the MegaDrive MR/5 RAID tested at Level 0 gets a 1.00, and the CoreArray 20000 tested at Level 5 gets a 0.47. Index numbers are listed to the left of system names. Remember, in most cases Level 0 systems should perform faster than systems using higher RAID levels. Several individual hard-drive mechanisms have been added for comparison.

Times are in seconds. Shorter bars are better.

Relative speed: 100% (fastest)   90%–99%   80%–89%   70%–79%   0%–69%

Overall fastest	RAID Level	# of Drives	Search 4D Database	Open 40MB Photoshop File	Save 40MB Photoshop File	Duplicate 40MB File
1.00 MegaDrive MR/5 RAID (S)*	0	5	294	78	52	27
0.95 Optima DisKovery 8200W (S1)	0	2	366	83	66	19
0.95 Optima DisKovery 3600DHW (S2)	0	2	349	83	67	20
0.91 Seagate ST12450W mechanism	NA	NA	406	83	57	24
0.89 La Cie Joule RAID (D)	0	2	324	92	63	26
0.88 Direct Connections DC3400W (S2)	0	2	402	88	68	22
0.86 MegaDrive MR/5 RAID (S)*	3	5	300	118	59	29
0.84 FWB SledgeHammer2000FMF (D1)	0	2	334	93	66	31
0.84 MegaDrive MR/5 RAID (S)*	5	5	295	92	61	46
0.82 Radius Studio Array (S3)	0	2	386	93	74	
0.82 DEC DSP3210S mechanism	NA	NA	327	95	74	32
0.81 FWB SledgeHammer4100FMF-W (S3)	0	2	389	93	76	26
0.81 Seagate ST12550W mechanism	NA	NA	346	103	70	30
0.79 Bottom Line Magic 4GB (S3)	0	2	366	103	75	29
0.78 Mirror Precision 4 (S3)	0	2	373	103	75	29
0.77 Mirror Precision 6 (S4)	0	2	362	111	75	30
0.75 MaxConcept SW-4100R (S4)	0	2	382	108	82	30
0.74 Microtech XLerator RAID P1700FW (S2)	0	2	343	86	**	19
0.72 Spin Peripherals RAIDline1 (D2)	0	2	342	113	80	39
0.69 Microtech XLerator RAID Empire (Q)	0	2	364	91	**	21
0.69 APS Arraid (S4)	0	2	366	112	86	42
0.68 Seagate ST12550N mechanism	NA	NA	359	112	94	42
0.60 APS Arraid (S4)	1	2	362	128	109	56
0.49 Core CoreArray 20000 (X)	3	4	339	191	159	98
0.47 Core CoreArray 20000 (X)	5	4	349	203	161	104

Overall slowest

*NA = Not applicable. *Contains 32MB RAM cache. **No result, due to bug in Atto's ExpressStripe 2.0 software; corrected in version 3.0, according to Atto.*

BEHIND OUR TESTS

Macworld Lab used a wide range of tests to show the full spectrum of RAID performance. To test speed in a database environment, we found an unindexed value in a 96,775-record 4th Dimension database. For figures on large-file performance, we opened and saved a 40MB Photoshop 3.0 TIFF file, with the scratch disk set to the RAID. We also duplicated a 40MB file in the Finder.

Macworld Lab also conducted larger-file duplicate tests; extensive tests of sustained throughput (transferring data in 20MB, 40MB, 80MB, and 160MB chunks to look for symmetry in performance); and low-level tests including read, write, and seek. We do not present the voluminous results of those tests, but they were entirely consistent with the overall performance figures shown above. We also ran spot tests with the Radius VideoVision Studio card for compatibility and video-capture performance. For video capture, we found that almost any RAID

Level 0 system using a single NuBus SCSI-2 adapter card can perform acceptably well if properly tuned.

We ran all tests on a Power Macintosh 8100/80 with a 250MB internal hard drive, 24MB of RAM, and a standard monitor. We ran System 7.5, with the display at 8-bit and AppleTalk turned off. We partitioned the drives in each system to give a total array volume of 2GB. In some cases this was the total capacity of the system, while in others it was just a fraction of the total.

We ran hot-swap tests on three systems: the Mirror Precision 6, MegaDrive MR/5, and CoreArray 20000. In each case we caused the failure of one of the drives in the array, then added a new drive and rebuilt the array. All three systems passed the test, although they suffered significant performance degradation during rebuild. —**Macworld Lab testing supervised by Tim Warner**

ly in a desktop video environment, is less because QuickTime imposes a significant bottleneck on data throughput. Aside from QuickTime, there are other bottlenecks to performance, but these should be eliminated in the next year or so.

■ **Network Speed** You can improve Ethernet speed by using switching hubs or fast Ethernet, both available now. In general, though, don't expect to get optimum performance from a Level 0 RAID system over a network.

■ **NuBus Speeds** Power Macs using

the PCI bus will ship later this year and should offer more than double the current NuBus speed.

■ **Processor Overhead** Power Macs based on the PowerPC 604 are also expected this year.

■ **File-System Speed** The next version of the Macintosh OS, code-named Copland, is expected to ship late this year or early next year. Changes to the Mac OS should improve drive performance.

■ **SCSI Transfer Speeds** High-performance interfaces—such as Firewire,

Ultra-SCSI, SSA, and Fibre Channel— may be available later this year, and all will offer better performance than the current SCSI-2 Fast/Wide standard.

Beyond Speed

As you build your RAID system, consider physical design as another ease-of-use factor. The systems from Spin, Microtech, APS, MaxConcept, and Optima use standard stand-alone drives. All of the other systems package two or more drives in a single box, with the exception of the

Vital Statistics on Tested RAID Systems

Vendor*	Product	Phone	Toll-Free Phone	RAID Levels Supported**	Formatted Capacity	List Price	Cost per GB
APS	Arraid	816/483-6100	800/233-7550	0, 1	4.1GB	$2899	$707
Bottom Line	Magic 4GB	512/892-4070	800/990-5793	0, 1	4GB	$5710	$1428
Core International	CoreArray 20000	407/997-6055	800/920-2673	3, 5	10GB	$19,996	$2000
Direct Connections	DC3400W	612/937-6179	800/572-4305	0, 1, 4, 5	3.4GB	$4755	$1399
FWB	SledgeHammer2000FMF	415/474-8055	none	0, 1	4.1GB	$2359	$575
	SledgeHammer4100FMF-W			0, 1	4.1GB	$5999	$1463
La Cie	Joule RAID	503/520-9000	800/999-0143	0, 1, 4, 5	4.2GB	$2999	$714
MaxConcept	SW-4100R	619/530-9062	none	0, 1, 4	4.1GB	$6085	$1484
MegaDrive Systems	MR/5 RAID	310/247-0006	800/664-6242	0, 3, 5	8GB	$18,840	$2355
Microtech International	XLerator RAID Empire	203/468-6223	800/626-4276	0, 1	2GB	$3780	$1890
	XLerator RAID P1700FW			0, 1	3.4GB	$6664	$1960
Mirror	Mirror Precision 4	612/830-1549	800/643-3374	0, 1, 4, 5	4.08GB	$5699	$1397
	Mirror Precision 6			0, 1, 4, 5	6.12GB	$8999	$1470
Optima Technology	DisKovery 3600DHW	714/476-0515	none	0, 1, 5	3.4GB	$5580	$1641
	DisKovery 8200W			0, 1, 5	8.2GB	$7790	$950
Radius	Studio Array	408/541-6100	800/572-3487	0, 1	4.1GB	$6999	$1707
Spin Peripherals	RAIDline1	617/630-1200	800/215-9200	0, 1	2GB	$1398	$699

Technical-support ratings are based on a series of calls made to each company by Macworld staffers (posing as customers) to gauge the accessibility, helpfulness, and accuracy of the company's panies, not individual products, and we call only those companies whose products Macworld Lab tests. *Other RAID vendors include Ciprico (612/551-4000), Conner Peripherals (408/ (818/709-3300), Procom Technology (714/852-1000, ext. 414), Raidtec (408/541-6100), Transoft (805/565-5200).* **Most vendors offer a range of products that support a range of RAID

La Cie Joule system we tested, which accommodates several drives in a modular, stackable system with a single power supply at the base. If desk space is an issue, consider one of the single-box systems or the La Cie Joule first.

The systems from Microtech have some irritating design characteristics— the logo on the front of the case is the power switch, the SCSI-address switch is on the bottom of the case, and the stands provided for keeping the cases vertical fell off every time we lifted a drive. Ironically, Microtech mysteriously shipped us extra boards and cables that we couldn't use but didn't include RAID documentation with one of the systems. We also noted on the system from Bottom Line that the drive-activity LEDs in the case were not actually connected to the drives.

In addition to the Photoshop problems with the Microtech systems, Macworld Lab noted some random system crashes during tests with systems from FWB, Mirror, and Optima. We also had serious problems with the MegaDrive system; we eventually traced the problems to a defective controller card, but this took us several days to correct. We were glad we spent the time, as the MegaDrive system ended up as the top performer.

The three hot-swap systems, from MegaDrive, Core, and Mirror, were subjected to real-time drive-failure tests. We caused a drive to fail by pulling it from the array while the system was powered

up and in use. We then tested the array's ability to reconstruct the failed drive by inserting a new drive. (We didn't need to insert a new drive for the Core system, which comes with a hot spare, an extra drive that automatically kicks in to rebuild the array.) All three systems passed this test. We should note that the performance of the arrays during rebuild was significantly slower than normal.

The Mirror Precision 6 has one dedicated power supply per drive, with all power supplies providing power to two fans. Should one power supply fail, you would also lose the use of the drive it was supplying. There is no notification of a fan failure, and we found that although in theory you can remove a failed fan while the system is powered up, we were unable to reach the power-cord connector on the higher fan without removing the lower fan as well. Even a temporary loss of both fans might overheat the system.

We much preferred the MegaDrive and Core designs. Their dual redundant

power supplies and fans are arranged such that any one component can fail and the entire system will still function. These systems also provide notification of a failed fan or power supply.

Buying Strategy
After you determine what you need for total storage, performance, and data re-

DON'T SPEND MORE THAN NECESSARY TO MEET THE RELATIVELY MODEST REQUIRE- MENTS OF DESKTOP VIDEO

dundancy, remind yourself why you are considering a RAID system. If you're looking strictly for performance, a RAID Level 0 array is your best bet. But don't overbuy. While you may never be able to get too much speed for prepress work, don't spend more than necessary to meet the relatively modest throughput requirements of desktop video.

If your primary need is for data protection, get a system that supports data redundancy. If preventing system downtime is critical (such as for a medical-records or accounting system), make sure the system also supports hot swapping and has redundant components. This can

SCSI-2 Card Included	Drive Type	Background Rebuild	Warranty (in months)	Tech-Support Rating
no	Fast	yes	60	not rated***
yes (2 cards)	Fast/Wide	yes	60	poor
no	Fast	yes	60	excellent
yes	Fast/Wide, dual-head drive	yes	60	poor
no (uses dual SCSI bus in 950/8100)	Fast	no	48	acceptable
yes	Fast/Wide	no	48	acceptable
no	Fast	yes	60	acceptable
no	Fast	yes	24	very good
yes	Fast/Wide	yes	24	very good
yes	Fast	no	60	acceptable
yes	Fast/Wide	no	60	acceptable
yes	Fast/Wide	yes	24	very good
yes	Fast/Wide	yes	24	very good
yes (2 cards)	Fast/Wide, dual-head drive	yes	12	not rated
yes (2 cards)	Fast/Wide	yes	12	not rated***
yes	Fast/Wide	no	12	very good
no	standard	yes	60	not rated

be expensive, but consider what it would cost to re-create the accounts of scores of clients, or what havoc a lost file can impose on a press schedule.

The easiest way to compare prices is to look at the cost-per-gigabyte column in the product table. These figures point up some interesting disparities. The FWB SledgeHammer4100FMF-W and the Radius Studio Array performed similarly and use identical drives and SCSI cards, yet the Studio Array costs almost $250 more per gigabyte. One wonders if Radius's superior documentation and specialized video support are worth the difference.

Cost and performance may not always be overriding considerations, however. Also look at ease of use, vendor reliability, the quality of documentation, and technical support. Remember, you will probably need help with these complex systems. Core International was the only RAID-system company that performed well enough on our tech-support testing to gain an excellent rating (aside from software vendor Trillium Research), though MaxConcept, MegaDrive, Mirror, and Radius all provided very good technical support. Bottom Line and Direct Connections were unable to answer any of our questions correctly—hardly reassuring, particularly if this purchase will be your first RAID system.

Documentation was similarly uneven. While the Radius manual was clear and helpful, one of the Microtech systems came without any manual whatever, and Optima didn't bother to send a manual for its RAID software—although after our tests were complete we got a draft copy of the Optima documentation. The MaxConcept manual had no illustrations even though setup requires opening your Mac and installing cabling.

The Last Word

The products we tested represent a good cross section of the current crop of Macintosh RAID—a market dominated by Level 0 systems. Compare the various systems with the reference tests we ran on stand-alone drives. You may find that for applications—such as searching a massive database—you'll be better off just buying the right drive and a SCSI card.

If you've got more time than money, consider building your own RAID system. Trillium's Remus RAID software is available as a separate product, and you can shop for the best price on drives from any vendor. If you're planning on using your RAID for desktop video, however, we don't recommend this approach. There are more than 60 different configuration parameters on modern hard drives, and setting up a given pair of drives optimally for desktop video requires specialized knowledge. Our spot tests showed that the correct settings can make the difference between dropped frames and a perfect capture. Stick with a vendor (such as Radius, FWB, MaxCon-

cept, and Direct Connections, among those whose systems we tested) that understands how to prepare a RAID for desktop video. (Radius designed its Studio Array specifically for desktop video users.)

For top performance in a RAID Level 0 system, the Optima 8200W or 3600-DHW get the nod, though for most users the speed advantage over the FWB SledgeHammer2000FMF would not justify the Optima systems' far higher cost.

If you need both data redundancy and minimum downtime you need a hardware array with hot-swap features. The Mirror Precision 6 is a relatively low-cost system with the basic features, but it's lacking in both performance and adequate hardware redundancy. The CoreArray 20000 has all the features you might need, but its performance was sorely disappointing—though adding a SCSI-2 card would greatly improve that record. The expensive MegaDrive MR/5 is an obvious choice for RAID Levels 3 and 5—with top performance on Level 0 as a bonus.

Whatever configuration you decide on, remember to ask a selection of vendors for information on the full range of their offerings. Armed with the right questions, you should be able to get a system tailored to your specific needs. That's the beauty of RAID—more than any other storage solution, it's got something for nearly every high-end storage need. m

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RAID SYSTEMS

MW EDITORS' CHOICE Among a cross section of available RAID systems, we selected two for their balance of speed, effective design, customer support, and overall value.

RAID 3 or 5
MR/5 RAID This unit offers excellent performance and very good technical support, along with the protection of true data redundancy—if you can afford it. **Company:** MegaDrive Systems. **List price:** $18,840.

RAID 0
SledgeHammer2000FMF A surprising bargain with reasonable speed from a reliable premium-drive vendor. **Company:** FWB. **List price:** $2359.

The Paper

Paper

CHASE

ACROBAT, ENVOY, AND OTHER NEW-GENERATION PORTABLE-DOCUMENT

PROGRAMS OFFER

TO REPLACE

PAPER DOCUMENTS.

DO THEY

DELIVER?

by Galen Gruman

You can forgive the 1.0 version of any product for having rough spots, especially when the first-generation software is designed to solve a new type of problem or an old problem in a new way. Such was the case with portable-document software, which in 1993 caused a great deal of buzz. This one technology, developers claimed, would tackle so many problems—too many paper documents needlessly killing trees, piling up unused in warehouses or filing cabinets, and causing frustration among businesspeople unable to find the document they needed in the sea of papers around them.

While you can easily move documents around by E-mail, server, or disk, you can't assume that everybody has the right fonts on their systems, or that they have the right program to open your document, or even (in a cross-platform environment) the right setup to receive the document. You could spend a lot of time and money installing the same software and fonts, plus the requisite extra hard-disk space and RAM, on every system to allow document portability—and then train people on each program used to create the documents in the first place. But of course you don't, and neither do most other people.

This problem was obvious, and soon several companies offered a software

solution: portable-document programs. First came No Hands Software's Common Ground (415/805-5800). Adobe Systems later shipped Acrobat (408/961-4400), which legitimized the field. Farallon Computing followed quickly with Replica (510/814-5000).

By creating electronic documents that carry all the needed components—fonts, graphics, and even a program (called a viewer or reader) to view and print the document—this type of software could eliminate the cost and time of printing, distributing, and storing paper copies, while adding the ability to find text and link multiple documents so information would be both more accessible and more dynamic.

Although known in industry parlance as portable-document software, what distinguishes the technology is not its portability—E-mail and networks make a document portable, after all—but its autonomy. Portable documents are self-reliant entities that remain intact no matter what their environment.

Whether for use within a company for document exchange and distribution, or for use on bulletin-board systems, CD-ROMs, and fax-back services for user-requested documents, the possibilities for portable-document software were beguiling.

But the first generation didn't live up to its promise. The initial programs had gaping holes, not just rough spots, in the capabilities they offered. For example, Acrobat had no distributable reader, thus imposing an unrealistic cost for those wanting to distribute documents widely. Replica had great difficulty with fonts and graphics, resulting in documents that bore poor resemblance to the original.

However, several companies are trying to fix that by offering a second generation of portable-document tools: Acrobat 2.0 tries to go the next step, and No Hands Software promises to follow suit

with the forthcoming Common Ground 2.0. In addition, two new players enter the fray: Novell's WordPerfect Envoy 1.0 (801/429-7000) and Apple's portable digital document (PDD) feature in System 7.5 (408/996-1010). Do they fulfill the portable-document promise?

Three Classes of Use

One reason that portable-document software is uneven is that it is aimed at three types of users, whose needs differ.

■ **Collaboration** Workgroups need tools that let them work in concert on documents, so they can trade comments and incorporate elements of shared documents into their own. High fidelity, small file sizes, annotation tools, and search capabilities are important. A free viewer is less important, but an affordable annotation-and-search tool is a must.

■ **Repository** Corporate communications and information-services departments want a tool that lets them put common documents into a repository that anyone can access—not just to view but also to search. Here, capturing text that can then be highlighted, copied, and searched by recipients is key, as is generating small files so the network doesn't get bogged down. Fidelity and free viewers are less important but desirable.

Certainly, inexpensive viewers are a must.

■ **Distribution** Electronic publishers need a tool to create computer-based versions of their documents for read-only use. It's the electronic equivalent of a fax, useful for the distribution of newsletters, price lists, and forms, for example. Here, high fidelity and small files are key, as well as a free viewer program.

With these distinct markets in mind, Macworld Lab put Apple's PDD feature and the four portable-document programs (Acrobat, Common Ground, Envoy, and Replica) through their paces to see if they live up to their primary mission: producing accurate renditions of exchanged documents.

The results from the Macworld Lab tests were surprising—even the second-generation programs have problems with some fonts and the standard page-layout programs. Only Adobe's Acrobat 2.0 comes close to what's needed on the broadest scale. It handles electronic distribution, content search, and document management. Novell's WordPerfect Envoy is similar to Acrobat, except that font fidelity is not a given unless everybody uses the same fonts in their systems. Envoy also does a poor job of reproducing images from QuarkXPress and Page-Maker files, and it doesn't offer the cross-

document searching feature that Acrobat 2.0 has. Both programs are best suited for collaboration and repository usage.

(PageMaker and QuarkXPress are key tests for portable-document tools, since both programs use their own printing engines, rather than the Mac's Quick-Draw or Windows' GDI. That often trips up portable-document software.)

For people who mostly need to distribute documents electronically, Common Ground 1.1.2 is a fine choice. The program retains decent constancy of text and graphics, offers protection of these elements so you can distribute information without fear that the material might be used in other documents, and Common Ground's embedded viewer is a manageable size. Replica offers similar capabilities, although it performs poorly in maintaining the original appearance of graphics from the two key publishing programs: PageMaker and QuarkXPress.

Apple's portable digital documents have almost no value. All you get is a static, bitmapped version of your document that you can view and print. You can't search, you can't highlight, you can't annotate, you can't skip among pages, you can't work across platforms, and you can't rearrange the layout to suit your needs. Plus you need to run the QuickDraw GX component of System 7.5, something that consumes a lot of memory and has difficulty with several print, fax, and portable-document drivers.

Collaboration and Repository: Use Acrobat or Envoy
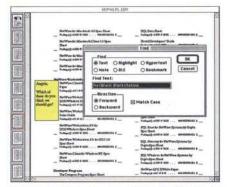
Both Acrobat and Envoy are decent choices for creating shared documents for lookup (such as corporate phone directories) and markup (such as draft memos circulated for comments). The differences between the two programs come down to issues of complexity.

Program Options For Acrobat, the complexity begins when you go to buy it: it comes in several configurations. There's the $195 Acrobat Exchange, which lets you create, annotate, and view documents; but for others to share the wealth of your information, they must each shell out the full price of the program. The $595 Acrobat Pro includes Exchange and Distiller. Distiller converts PostScript print files into portable documents, which is useful if you have a repository of PostScript files or if you use Unix or PC software (such as for CAD and documentation publishing) that has no Mac equivalent. The best buy of the bunch is the $1595 Acrobat for Workgroups version, which has ten licenses for Exchange, one for Distiller, and one for Catalog, a Windows-only indexing tool that creates

indexes to let you search across multiple documents (normally you can search only within a document). Acrobat for Workgroups includes both Mac and Windows software for Exchange and Distiller so you can use it for both Mac-only and cross-platform networks.
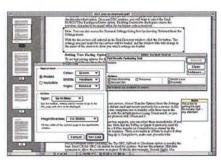
Like its competitors, but unlike Acrobat 1.0, all of the Acrobat 2.0 packages include the Mac and Windows versions of Reader, a program you can freely distribute so recipients can read, search, and print Acrobat documents.

Acrobat requires the use of Adobe Type Manager, a font-fidelity engine, in version 3.6 or later; version 3.8.1 is bundled in the Exchange, Pro, and Workgroups packages. Acrobat's Reader won't run unless you have a full version of ATM 3.6 or later installed.

Envoy is simpler: the $195 program comes in one package, and the software comes on just one disk. Envoy lets you do essentially what Acrobat Exchange does, and Envoy's Reader is similar to Acrobat's Reader, except that you can embed Envoy's Reader in your document (adding about 360K), rather than distributing a 1.2MB file that the recipient must install,

Information Envoy Novell WordPerfect Envoy 1.0 gives you thumbnail views, hypertext links, comprehensive search capabilities, and a highlighting tool to simplify the perusal of information in a document. Unfortunately, font fidelity is often poor. Fortunately, system requirements are light.

Page Acrobat Adobe Acrobat 2.0 offers page thumbnails, hypertext links, and a sophisticated search engine, all of which make document navigation fairly simple. The price for these features is higher resource requirements than other programs.

as you must with Acrobat. Envoy also has a stand-alone viewer, available in Mac (650K) and Windows (200K) versions, which is helpful in instances where you don't know what platform your recipient uses. The stand-alone viewer is also preferable in a cross-platform network: Windows users can't launch an Envoy document that contains an embedded Mac viewer; they need the stand-alone Windows viewer, which will ignore the embedded Mac viewer. Macintosh users face the same problem with documents using an embedded Windows viewer. Envoy does not require the use of ATM, but you'll want ATM 3.6 or later anyhow because of Envoy's poor font fidelity.

Font Fidelity Envoy can neither embed fonts nor emulate their appearance. Instead, the program substitutes the closest font it can find, and my experience is that this process misses more often than it hits, particularly for PostScript fonts. Another serious drawback to Envoy is the poor reproduction it offers of bitmapped images in PageMaker and QuarkXPress documents (see the samples in "A Question of Fidelity").

Acrobat is better at font fidelity, but it is hardly perfect. Acrobat occasionally converts fonts it doesn't know how to handle—typically symbols and nonroman fonts but sometimes fonts created by programs like Macromedia Fontographer and Ares Software FontMonger—into bitmaps, so you can't search any text using them. To get around this you can embed the problem fonts in your document (via Page Setup) before printing to Acrobat format, or you can print to a PostScript file with fonts included and use Distiller to generate the Acrobat document.

Document Markup For annotation and markup, it's a draw between Acrobat and Envoy.

No matter which you use, keep in mind that you'll need to produce your documents with portable-document use in mind. Unlike documentation software, such as Frame Technology's FrameMaker ($895, 408/975-6000), portable-document programs are not complete authoring tools, despite some similar features.

For example, both Acrobat and Envoy let you insert bookmarks, view thumbnails of your document's pages (which you can rearrange) so you can quickly decide where you want to go, and add sticky notes (with customizable colors and names, so in a multiuser setting, you can tell who wrote what).

In addition, both programs can create hypertext links between sections of your document, only they don't change the hypertext color as FrameMaker does—you need to color that text in your

A Question of Fidelity

It's hard to overstate the need for faithful reproduction of portable documents. After all, if you needed to share just the text, you'd send a text-only version of the document.

To gauge fidelity, Macworld Lab created several documents using a variety of fonts and image types. The images here show where the portable-document programs had problems. If you're using PICT images, uncomplicated EPS images, and basic TrueType and PostScript fonts, any of the portable-document programs can render a decent version of the original—except for Envoy when the original file is created in QuarkXPress or PageMaker.

	Original	Acrobat Exchange 2.0	Replica 1.04	Common Ground 1.1.2*	Envoy 1.0
CMYK TIFF					
Complex EPS					
PICT					
Fonts (default settings)	Remedy / Poppl-Laudatio / Garamond Condensed / DELPHIAN / Latin Wide	Remedy / Poppl-Laudatio / Garamond Condensed / DELPHIAN / Latin Wide	R emedy / Poppl-Laudatio / Garamond Condensed / Delphian / Latin Wide	Remedy / Poppl-Laudatio / Garamond Condensed / DELPHIAN / Latin Wide	R emedy / Poppl-Laudatio / Garamond Condensed / Delphian / Latin Wide
Fonts (optional settings)	DELPHIAN	DELPHIAN	DELPHIAN	DELPHIAN	Delphian

*Requires PostScript Level 2 device to print in color.

originating word processor or page-layout program. But both programs put a color frame (your choice of color) around the hypertext.

However, the two programs set up links differently. Envoy has a palette of nine hypertext jump icons you can insert (including arrows, a target, and a frog); in Acrobat, you have to add any such graphics in the originating program. But Acrobat lets you control the view the user gets of the destination page when he or she double-clicks on a hypertext link, and Acrobat lets you link across documents, not just within them. Envoy's advantage is that creating links is more intuitive.

Envoy's links falter after you insert or delete pages—the program is not smart enough to adjust the link destinations after repagination. Still, given Envoy's simpler resource requirements, you should go for it over Acrobat if your primary need is markup.

Repository Documents If your goal is to centralize documentation—everything from phone lists to operations manuals, from product lists to press releases—and make it accessible to your whole company, Acrobat is your answer, but only if you use a cross-platform network. This is because Acrobat's Catalog program runs only on Windows 3.1 servers, and it is incompatible with Farallon's PhoneNet PC software, so you can't use Catalog to index Mac files on a cross-platform AppleTalk network. (TCP/IP and NetWare networks should work fine.) A workaround is to transfer your Mac Acrobat files to a Windows PC, create the indexes in Windows, and move the files and their indexes back to your Mac network. This approach also works if you create CD-ROMs.

The Catalog program in Acrobat for Workgroups generates search indexes that let users look for text in any collection of documents in a particular folder and its subfolders, which makes it easy to find all related documents. Acrobat uses the Verity Topic search engine, a tool that does sounds-like and grammatical-

variation searches. The Verity engine also estimates how good a match each document is to your search parameters.

Note that the Verity search tool comes with Exchange but not Reader. Thus, if you try to save money by buying Exchange for just document creators and using the free Readers for everyone else, Reader users won't be able to use the Verity search features (including the cross-document search), and your investment in Catalog will be for nought.

Realize also that you can't count on Acrobat to create documents shared outside your corporate environment, such as for online documentation to be distributed by BBS, floppy disk, or CD, since you can't guarantee that those people will have the right version of ATM installed.

All in all, Acrobat is a better program than Envoy for creating companywide searchable files, but there's still room for improvement, particularly because there is no good solution for creating repositories that are searchable by customers, subscribers, and others whose systems you don't manage. Perhaps that solution will come in the form of plug-in modules, similar to the XTensions in QuarkXPress and the plug-ins in Adobe Photoshop that add functionality to a program, since one of the major enhancements to Acrobat has been support for plug-in technology. In fact, the Verity Topic search feature in Acrobat is one such plug-in that Adobe bundles with the product.

While Adobe expects many plug-ins to be developed for niche markets, one broadly useful plug-in it is developing is an OCR feature that would let you scan documents, do character recognition, and then create an Acrobat document based on the recognized text. Another technology that could help Acrobat in the corporate sphere is its support of AppleScript, which lets you automate repetitive tasks.

Distribution: Use Common Ground or Replica
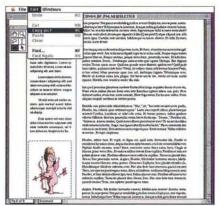
If your goal is one-way distribution to a wide range of people, you can't necessarily count on Acrobat or Envoy to handle your distribution needs. To use Acrobat, everyone must have ATM installed; to use Envoy, everyone should have the same fonts. For distribution, you want software designed to produce files that are faithful to the original, that anyone can read or print, and that recipients can optionally search and copy content from. That leaves Common Ground and Replica.

Program Options The $189.95 Common Ground 1.1.2 has been around longer than any of the competition, and it still offers the best set of features for the distribution market. That's because it

works, easily and simply. The $195 Replica offers features similar to Common Ground's but doesn't work as smoothly.

Common Ground 2.0, which was still in early development at press time and unavailable for preview in either Windows or Mac versions, is supposed to use a new font-fidelity engine (Bitstream's TrueDoc) and to add many of the collaboration and repository features that Acrobat and Envoy offer, while retaining its small embedded viewer and distribution strengths. Originally scheduled to ship by the end of 1994, look for Common Ground 2.0 sometime by spring.

Document Control Common Ground 1.1.2 offers just what's needed for the distribution market: control over what others do with your document. You can prevent recipients from printing files, copying text, or copying graphics—or any combination of the three. That's important for publishers, who often want users to be able to excerpt the text but not the images (because of different copyright agreements reached with authors and artists). Replica offers only the option of

Simple Common Ground No Hands Software's Common Ground 1.1.2 lets you easily exchange files with users both off and on your network. It doesn't offer document-navigation capabilities, but does let you copy out text and pictures.

Approximate Replica Farallon Computing's Replica 1.04 provides straightforward document exchange for viewing and printing, but font fidelity is uneven. However, the program does preserve formatting in text copied from its files.

restricting the recipient to viewing.

Both Replica and Common Ground offer basic text-search capabilities (by word, for example) that are sufficient for distribution of individual documents.

You can embed a Common Ground viewer, which lets anyone view or print a Common Ground document, in your document. Best of all, and unique to Common Ground, you can choose whether to embed a Mac or Windows viewer, so you can do your authoring on the Mac and distribute fully self-contained portable documents to people on both platforms. And since it's the smallest embedded-viewer size around—just 90K for the Mac and 100K for Windows—you can afford to routinely embed the Common Ground viewer. Of course, you can also distribute the Mac and Windows viewers separately, and not embed them in your Common Ground documents. This last scenario is best for BBS operators or online services who don't want to boost the file size for each document unnecessarily.

If you want your recipients to search for text in your files or copy out text or graphics, they'll need the full version of Common Ground installed. The embedded and stand-alone viewers just let them print and display documents. Replica also embeds a viewer, which amounts to sending along the full Replica program—at a cost of about 400K. Both programs let users select text in columns, although Replica's method is simpler.

Electronic Publishing To ease distribution, Common Ground lets you send files via E-mail from within the program, but only if you use System 7's PowerTalk E-mail feature (included with System 7 Pro and 7.5, optional in System 7.0 and 7.1). Replica is not much more compatible: it supports just Microsoft Mail (which Microsoft has stopped developing for the Mac) and Farallon's own Timbuktu.

Additionally, to ease production, both programs let you drag and drop files onto creator programs, thereby launching the files' creator and generating the portable document, using default settings. I find it easier to create the portable documents from within Common Ground or Replica (both programs offer keyboard shortcuts so you can skip going to the Chooser to change the target printer), since I can then control output settings.
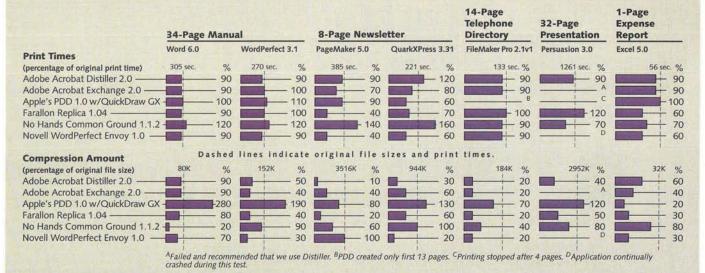
Common Ground captures the text that can be highlighted, copied, and searched when you print, and it saves a bitmap version of the file so fonts reproduce decently if the recipient doesn't have them (Common Ground uses the actual fonts if the recipient does have them). As with other portable-document programs,

Where Do Portable-Document Programs Excel and Fall Short?

Shorter bars are better.
Products are listed alphabetically.

Portable-document programs face basic challenges in three areas: file size, since smaller sizes make distribution easier; print times, since long print times inhibit the use of documents by their recipients; and image and font fidelity, since poor reproduction will hinder portable documents' acceptance as an alternative to paper. Macworld Lab tested all three areas (the output samples in "A Question of Fidelity" show the fidelity results).

	34-Page Manual		8-Page Newsletter		14-Page Telephone Directory	32-Page Presentation	1-Page Expense Report
	Word 6.0	WordPerfect 3.1	PageMaker 5.0	QuarkXPress 3.31	FileMaker Pro 2.1v1	Persuasion 3.0	Excel 5.0
Print Times (percentage of original print time)	305 sec. %	270 sec. %	385 sec. %	221 sec. %	133 sec. %	1261 sec. %	56 sec. %
Adobe Acrobat Distiller 2.0	90	90	90	120	90	90	90
Adobe Acrobat Exchange 2.0	90	100	70	80	90	A	90
Apple's PDD 1.0 w/QuickDraw GX	100	110	90	60	B	C	100
Farallon Replica 1.04	90	100	40	70	100	120	60
No Hands Common Ground 1.1.2	120	120	140	160	90	70	70
Novell WordPerfect Envoy 1.0	90	90	40	60	90	D	60

Dashed lines indicate original file sizes and print times.

	34-Page Manual		8-Page Newsletter		14-Page Telephone Directory	32-Page Presentation	1-Page Expense Report
Compression Amount (percentage of original file size)	80K %	152K %	3516K %	944K %	184K %	2952K %	32K %
Adobe Acrobat Distiller 2.0	90	50	10	30	20	40	60
Adobe Acrobat Exchange 2.0	90	40	40	60	20	A	40
Apple's PDD 1.0 w/QuickDraw GX	280	190	80	130	70	120	20
Farallon Replica 1.04	80	40	20	60	20	50	30
No Hands Common Ground 1.1.2	20	90	60	100	40	80	80
Novell WordPerfect Envoy 1.0	70	30	100	20	20	D	30

AFailed and recommended that we use Distiller. BPDD created only first 13 pages. CPrinting stopped after 4 pages. DApplication continually crashed during this test.

BEHIND OUR TESTS — Because the number and type of fonts and images play a key role in determining how successfully a portable-document program creates a portable document, Macworld Lab used several real-world documents to show the range of results each program delivers. In all cases, we used the programs' default settings; options such as font embedding would add to the file size. We tested the programs on a Power Mac 7100/66 with 16MB of RAM running System 7.5. QuickDraw GX was installed only for tests of Apple's Portable Digital Document (PDD).—**Macworld Lab testing supervised by Matt Clark**

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having the font-emulation features of ATM 3.6 augments Common Ground's native capabilities.

While Common Ground limits you to printing at 300 dpi, Replica lets you embed TrueType fonts in your document, so recipients can print text at their printer's top resolution. But Replica can't embed PostScript fonts, which limits their resolution to 300 dpi.

Both programs let you downsample your document's resolution to 72 dpi (for on-screen viewing), which saves file size. Common Ground also lets you create files using JPEG compression to further reduce image size, but as with all JPEG compression, the greater the compression amount, the less faithful the image will be.

In its testing, Macworld Lab found that Common Ground's graphics quality (with the maximum 300-dpi resolution selected) was decent, but not as good as the original. What's happening is that Common Ground is downsampling the image resolution to 300 dpi, not to the maximum printer resolution, as Acrobat and Envoy do.

Replica fared comparably well with regard to PICT and EPS files, but its quality for TIFF images was unacceptable when printing from both PageMaker and QuarkXPress. The cause was Replica's difficulty working with the print engines in PageMaker and QuarkXPress. Still, for

a portable-document vendor not to find a way to work with their quirks is foolish.

Replica can be more confusing to use than Common Ground, mostly because you can't access many of its options until after you create the portable document. This makes creation a two-step process: print to a Replica document and then open Replica to set options.

Even with its limitations, Common Ground is the better bet for document distribution than Replica. It's easier to use to create documents, and although I'd like the embedded and free viewers to offer a little more capability, the immediate cross-platform support, security options, small files, and reasonable faithfulness to original document formats make Common Ground useful for almost anyone.

The Last Word

Portable-document software hasn't lived up to its original promise, but maybe both developers and users have expected too much. As the major programs focus on more-defined markets, more-useful products should result. The current generation reflects more than a hint of this new focus. Go and take advantage of today's portable-document tools, but don't delude yourself into thinking that these tools mean you no longer need to standardize on word processors, layout programs, fonts, and other communications

tools. Portable-document software is not the grand unification of creation, distribution, and access software, but it is a compelling technology for certain tasks. **m**

Executive editor GALEN GRUMAN focuses on emerging technologies.

PORTABLE-DOCUMENT SOFTWARE

MW EDITORS' CHOICE In evaluating portable-document software, we insisted on fidelity of images and text first, and then on features appropriate to the target markets. For collaborative and repository uses, we decided to make no recommendation. Although WordPerfect Envoy does fairly well for collaborative efforts and Adobe Acrobat, for shared-repository use, neither program is yet good enough to earn an Editors' Choice in those categories.

Distribution

Common Ground 1.1.2 Even with a few flaws, Common Ground 1.1.2 is simplest to use and offers the best options for creating documents to be distributed to a wide, heterogeneous set of people. **Company:** No Hands Software. **List price:** $189.95.

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Graphics

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Plugging into Illustrator

TWO NEW SETS OF ILLUS-trator filters are joining the growing arsenal of third-party plug-ins for 5.0 and later versions of Adobe's professional-level drawing program: Infinite FX from BeInfinite and an as-yet-unnamed product developed (as Sree's Cool Tools) by Intrepid Systems and just acquired by HSC Software. Special effects offered by the HSC product include 3d Extrude, 3d Perspective, Bevel Emboss, Envelope Distort, Swirl, Fragment, Crumble, and Shatter. All but the last three (which rely on nonnative Illustrator code) are Power Mac–native. Path Blend and Radial Sweep Blend require Illustrator 5.5. HSC is redesigning the program's interface and plans to add more filters to the mix.

Infinite FX contains 55 filters, including Cornerize, Wiggle, Balloon, Motion Blur, Bend, Twist, and Cylinder Wrap. Others—such as Pinch, Zoom, Fisheye, and Pond Ripples—emulate effects familiar to Adobe Photoshop users. Some of the more unusual filters include Metapunk, which gives letters a furry look, and TCB (Tension, Continuity, Bias), which lets you change the tension and smoothness of a curve. In addition, Infinite FX's 3-D feature lets you rotate and add perspective to an image while applying any filter. BeInfinite reports that Infinite FX works with Macromedia FreeHand 5.0 as well; HSC could not say whether its filter set would also be FreeHand-compatible.

Infinite FX began shipping in early January; a Power Mac version came out a few weeks later. The introductory price of $99 goes up to $149 after April 1. HSC's product is due to ship in spring 1995; price was not set at press time but should be comparable to those of the rest of the KPT line. BeInfinite, 404/552-6624; HSC Software, 805/566-6200.—C.A.

HANK OSUNA
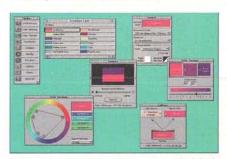
Precision Color Measuring

LIGHT SOURCE'S COLORTRON DIGI-tal Color Sensor, first described in *Graphics* news, *Macworld*, June 1994, finally began shipping in December at a retail price of $1195. Combining the functionality of a spectrophotometer, a colorimeter, a densitometer, and a monitor calibrator, Colortron also includes software for color control and manipulation.

Using spectral data, the Colortron software lets you compute new colors from existing ones, compare colors, and convert colors between color spaces and color models. You can save Colortron-defined colors in EPS-format Palette Documents, which can then be accessed by such programs as QuarkXPress and Macromedia's FreeHand and Adobe's Illustrator and PageMaker. Colortron also includes digital-color libraries for standard color-matching systems. Light Source, 415/925-4200.—C.A.

Colortron's tools include Color Harmony, which finds color combinations that complement a chosen color, and Color Tweener, which lets you specify a shade between two input colors.

Drawing the Natural Way

TWO PROGRAMS THAT take a different approach to illustration were introduced at Macworld Expo in January. LightningDraw GX by Lari Software and SmartSketch by FutureWave Software both feature a natural drawing environment designed for those who find existing draw programs too structured and difficult to learn.

LightningDraw GX is a Power Mac–native draw program that fully supports QuickDraw GX, including sophisticated typographic controls and multilingual fonts. Like Smart-Sketch, it provides paint capabilities—enabling you to add brushstrokes and erase areas of an image. A reshaper tool lets you grab any point to change the shape of curves easily; multigon and star tools facilitate drawing complex shapes; while a scissors tool can remove pieces from a shape. Transformation tools let you scale, rotate, flip, skew, and add 3-D perspective. Other special effects involve merging, overlapping, cutting out, and subtracting shapes. You can customize gradient blends, set transparency levels, and convert text to shapes. Text features include automatic kerning and ligatures, and 3-D distortion and perspective. Distorted text remains in its altered form while you edit it. The program can handle unlimited layers, place EPS files, and import and export PICT files.

Created by the original developers of SuperPaint (now owned by Adobe Systems), SmartSketch is a vector-based draw program that includes paint features (such as a paint bucket), an eraser, and anti-aliasing. You can draw rough shapes and instantly straighten them into smooth, precise outlines. Because there are no handles or points to grab onto, you can change the shape of any line in a drawing by just dragging it in any direction. Separately drawn line segments are automatically joined to make a fillable area; the program can even be set to automatically close large gaps between lines.
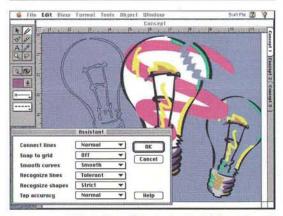
With SmartSketch you can work with multiple floating objects and paint inside or behind an object, or within selected areas. You can bring in PICT or EPS clip art and erase it; EPS files can be exported

to Illustrator and FreeHand. SmartSketch supports pressure-sensitive digitizer tablets. The first version won't be Power Mac–native, but a Power Mac version is expected to ship close on the heels of 1.0.

Due in March, LightningDraw GX will sell for $149. SmartSketch is expected to ship in the second quarter of 1995 and will retail for $69.95. Lari Software, 919/968-0701, FutureWave Software, 619/637-6190.—C.A.

LightningDraw GX's drawing tools let you dynamically add to, subtract from, or cut out parts of an object, while the reshaper tool lets you pull or push the outline of a shape (top). SmartSketch's Shape Recognition feature lets you turn rough sketches into precise drawings; you can also paint, erase, and lasso objects (bottom).

Radius Dye-Sub for $5000

RADIUS'S PROOFPOSITIVE 3.0 dye-sub printer offers 24-bit, continuous-tone, photo-realistic color at a competitive price of $4999.

For the money, you get a 300-dpi, full-page, full-bleed, dye-sublimation QuickDraw printer optimized for printing color photographs; a two-page ver-

sion is available for $11,999. The Proof-Positive 3.0 is also available with Adobe's Configurable PostScript Interpreter Level 2, a Power Mac–native RIP that promises rasterization up to 400 percent faster than on 680X0-based ProofPositive printers. The full-page PostScript version is $6499; a two-page configuration retails for $13,999. The rasterizing is handled by the Mac CPU. All versions of the Proof-Positive offer background printing and Radius's SuperSWOP color-matching system. Radius, 408/955-1556.

—JAMES A. MARTIN

Expert Graphics

GRAPHICS PROFESSIONALS SHARE THEIR SECRETS

by Cathy Abes

Artist: David Teich, a digital illustrator and animator based in Roosevelt, New Jersey, has been creating computer graphics since 1985.

How It Was Done: For this image, designed to illustrate cross-platform file transfer, Teich used a form of 3-D extrusion known as a path sweep. Whereas normal extrusion pushes the outline of a 2-D shape through space to give it depth, a path sweep extrudes the shape along a path—in this case, a spiral drawn in three-dimensional space.

Using the 3-D modeler formZ, Teich first generated a wire frame of a revolved sphere with the spherical-solids tool. With the section tool, he divided the sphere into 23 horizontal circles, then deleted the 11 sections below the center. In the top view, he drew 12 two-dimensional rectangles; after moving each rectangle vertically to match its corresponding circle in the side view, he deleted the remaining circles.

Using the polyline tool with Snap to Point set, he drew an angular spiral by snapping to one corner of the top rectangle, drawing a line down and clockwise, and snapping to the next point on the next rectangle, repeating the process until he had reached the last point on the last rectangle.

To create the source shape for the extrusion, Teich first drew a simple 2-D arc. With the sweep tool, he selected the arc and then the spiral path to create the swept shape. After placing the shape, he made a mirror image of it using the mirror tool in copy mode.
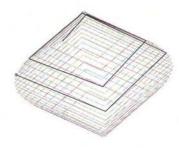
Before importing the model into ElectricImage for rendering, Teich created texture maps for each shape in Photoshop. For the apple, he used the gradient tool to make a horizontal red-to-green blend, then applied KPT's Pixelwind filter to roughen the surface. For the rough, dimpled surface of the orange peel, Teich created a bump map in an alpha channel by applying the Noise, Diffuse, and Blur filters, and then using Levels to heighten the contrast. **m**
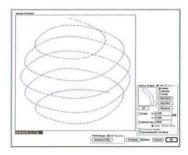
1 After generating a wire frame of a revolved sphere using formZ's spherical-solids tool, Teich used the section tool to divide the sphere into 23 circles.

2 After drawing the rectangles and matching each to the size and position of its corresponding circle, he deleted the remaining circles and used the mirror tool in copy mode to create a mirrored set of rectangles below the center line.

3 Teich used formZ's polyline tool to create an angular spiral by snapping to a point on one rectangle and drawing a line to the next point on the next rectangle, continuing until all the rectangles were connected.
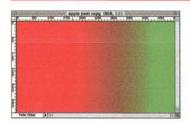
4 After he converted the line to a smooth curve, Teich created the sweep path by selecting the arc and the spiral path in the Sweep dialog box, where he adjusted the size and angle of the source shape on the path.
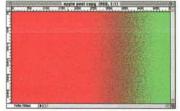
5 The swept shape shown in shade mode after it was returned to the modeling window.

TEICH
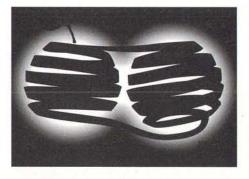
6 The horizontal linear blend Teich created in Photoshop as the basis for the surface texture he would map onto the apple.

7 The apple's texture map after he applied KPT's Pixelwind filter in Photoshop to create a rough surface.

8 To create the glowing outline around the objects, Teich first duplicated the alpha channel he'd created of the extruded-path objects. After applying Gaussian Blur to the duplicate, he loaded the original alpha channel into it and deleted the selected area to black. With the new channel loaded into the RGB image, he lightened the selected area with the Levels command.

THE TOOLS

Hardware: Mac 840AV with 64MB of RAM and 1GB internal hard drive; Radius LeMansGT 24-bit accelerated graphics card; RasterOps 20T (20-inch) color monitor; Wacom UD-1212 graphics tablet.
Software: autodessys formZ 2.6.1; ElectricImage Animation System 2.0; Adobe Photoshop 3.0; Xaos Tools' Terrazzo 1.0; Kai's Power Tools 2.0.

At Work

THE LATEST TOOLS FOR BUSINESS COMPUTING

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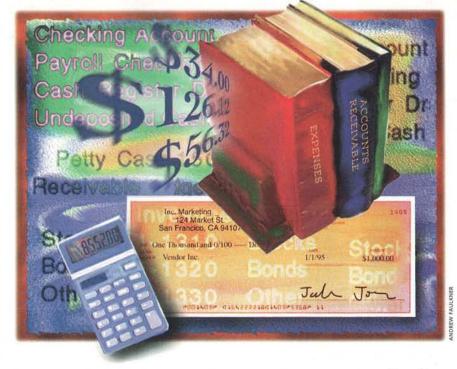
With QuickBooks, a small-business owner can generate an invoice within a few minutes of installing the software—you don't have to set up a complete chart of accounts first. The program can quickly generate a variety of customizable reports and graphs covering any period of time—such as a weekly income versus weekly expenses comparison. QuickBooks also automatically creates purchase orders, keeps track of available and on-order goods, and maintains an audit trail of all changes to the data. The program can track inventory under several different scenarios—you can record complete or partial shipments, for instance—and enables users to edit a transaction at any time. QuickBooks should be available by the time you read this at an estimated street price of $119. Intuit, 415/322-0573.—JAMES A. MARTIN

Big Sales System

IN THE QUEST TO PROVIDE WHATEVER it takes to close a sale, companies are turning to increasingly sophisticated software to help manage the sales process.

Altro Solutions, which develops custom sales systems for large companies, is marketing a package called Business Partner that runs on an Oracle server with a

Mac front end. Business Partner provides tools for standard sales-management tasks, such as tracking leads through the buying cycle; managing a sales team's contacts with multiple decision-makers at the client site; and projecting which deals will close and how much revenue they will generate. The system provides unusual capabilities as well. For example, all data is stored and transferred independently of the sales-tracking process, which makes it possible for a Business Partner user to extract a product's price and specifications and give that information on CD-ROM to clients and potential clients; to build a multimedia presentation into a certain stage of the sales pitch; or to upload and download leads, client assignments, and call reports via public online systems.

Business Partner pricing depends on the number of users and how much customization Altro performs. Altro Solutions, 408/345-4600.—D.L.

It's in the Cards

NOTEBOOK-BASED ORGANIZING SYStems are going digital. A while ago Franklin Quest published Ascend, a Mac version of its Day Planner; now Executive ScanCard Systems is shipping its ScanCard as a Mac application.

ScanCard—the paper version, and especially the digital version—differs significantly from the calendar-and-contact-list design of other organizers. ScanCard is based on grouping related file cards

ANDREW FAULKNER

together in the pockets of a portfolio. For example, contact cards for people involved in Project X and task cards for activities for that project would go in a pocket marked Project X.

A paper card can be grouped with only one project at a time, of course, but that does not apply on the Macintosh; a ScanCard card can be associated with any number of projects, with time and date stamps and with reminders to act on a card at some future moment. Scan-Card cards are not limited in size, and if the standard forms don't provide a place to record the information you need, you can design new forms. ScanCard can also search cards by con-

In ScanCard you can design card formats for managing information and store cards in a computerized wallet.

tents, priority, and type (though not, unfortunately, by dates). ScanCard version 1.0 lists for $149.95 from Planning Works, 614/436-5300.—D.L.

@Risk Takes Another Chance

PALISADE CORPORATION is upgrading @Risk, its risk-analysis add-in for Microsoft Excel, to version 2.0, with seven new distributions and other new analysis features.

When modeling a business, a manufacturing process, or other quantifiable system in a spreadsheet, you normally provide a single value for each variable—for example, raw materials will cost $500,000, or a certain task will take seven days. With a Monte Carlo simulator such as @Risk, you estimate how likely your variables are to fall somewhere within a range of values that you establish as lower and upper limits.

Version 2.0's new probability distributions include extreme value, inverse Gaussian, log-logistic, Pearson type V and type VI, Rayleigh, and student's t. Version 2.0 can also perform sensitivity analysis to determine which variables have the greatest impact on the outcome, and can run multiple simulations using different distributions and then display the results side by side.

@Risk should ship in January 1995 for $395, will be available in native Power Mac mode, and will run with Excel 4.0 or 5.0. Palisade, 607/277-8000.—D.L.

Mapping Excel Data

IT'S NO SURPRISE THAT THIRD-PARTY developers are steadily churning out specialized add-ins for Microsoft Excel: between Excel 5.0's Visual Basic for Applications, which simplifies developing add-ins, and Excel's near-ubiquity on the Mac, we can expect to see a steady stream of them. To wit, Excel for the Mac now boasts a map-drawing add-in like the one Lotus recently released for the Windows version of its spreadsheet, 1-2-3.

MapLand, developed and published by Software Illustrated, can read data from Excel files and display it on maps. For example, MapLand could break a table of sales results into ranges such as less than $1 million, $1 million to $5 million, and more than $5 million, and then color each state according to the range it falls in. For more than one data series—for example, a product line—MapLand can overlay column or pie charts on states. All of Excel's calculation, formatting, and other tools are accessible from within MapLand.
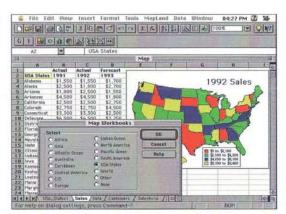
MapLand should ship in January 1995 for $99.95 with some geographical data, including U.S. state boundaries and

MapLand reads data from Excel worksheets, interprets fields containing geographical information, and displays the data on a map inside Excel.

national boundaries for all regions of the world. Complete sets of U.S. county boundaries or zip code boundaries are $139.95 per set. Software Illustrated, 510/463-9898.—D.L.

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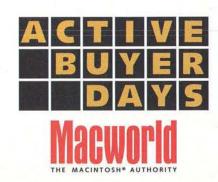
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BY JIM HEID

Working Smart

Quick Fixes for Speed Addicts

I'VE BEEN ADDICTED TO SPEED FOR years. I need it from the moment I start up until the moment I shut down, and it makes me feel irritable when I don't get enough.

Know what I mean? You can't own a computer for long before the twitching begins. Why doesn't that program start up more quickly? Why does the new version of WizzyWow Pro ooze like a glacier? Why does the CD-ROM drive run in slow motion? Why do cobwebs form during print jobs?

You need a fix. The most satisfying fix is, of course, a new and faster Mac—but even that high won't last forever. There's a better way to satisfy your craving: understand what makes some operations and components slow, and take steps to speed them up.

Disk-Intensive Tasks Are Slow

Bottlenecks: (1) The disk drive is too slow. (2) Files are fragmented—that is, scattered in pieces across the hard drive. (3) Too many fonts.

Solution 1a: Get a Faster Drive High-capacity hard drives—500MB and larger—are considerably faster than the 230MB and smaller drives many Macs ship with. To realize the best speed gains from a high-capacity hard drive, store your applications and your System Folder on it and use the Startup Disk control panel to designate it as the drive to use at start-up.

Solution 1b: Use a RAM Disk and Cache The best way to eliminate the hard disk bottleneck is to bypass the hard disk entirely with a RAM disk, a piece of high-speed memory that takes the place of the much slower hard drive. If your Mac has plenty of RAM—at least 16MB, preferably more—use the Memory control panel to create a RAM disk large enough to hold the System Folder and an application program you want to speed up. After copying the System Folder to the RAM disk, use the Startup Disk control panel to designate the RAM disk as the

start-up disk. A RAM disk will survive a restart, though not a shutdown.

Alas, today's bloated system software and applications demand a Texas-size RAM disk. Try putting the RAM disk's System Folder on a diet: eliminate help files, unessential printer drivers and control panels, and the like. Or use Connectix Corporation's Maxima ($99; 415/571-5100, 800/950-5880), which can create a double-size RAM disk (for example, setting aside 8MB of RAM yields a 16MB RAM disk). Maxima's memory-doubling tricks slow a RAM disk slightly, but you'll still get much better performance.

A RAM disk's memory is unavailable for general system use, so consider tossing in Jump Development's OptiMem ($129; 412/681-2692), a utility that uses RAM-juggling techniques to fit more programs in memory. Unlike Maxima (and its cousin, Connectix's $99 RAM Doubler), OptiMem doesn't expand the Mac's memory; it optimizes how programs use the existing memory.

The RAM cache in System 7.5's Memory control panel can also yield a modest speed improvement. If you have more than 8MB of memory, consider cre-

ating a cache of between 512K and 1024K. But don't go overboard: as with a RAM disk, the cache memory isn't available to run programs.

Solution 2: Tune Performance If you frequently add and remove files on your hard drive, use a disk optimizer to reduce fragmentation; these utilities store files in contiguous tracks and sectors so they're read quickly. Good disk optimizers include Alsoft's DiskExpress II ($89.95; 713/353-4090, 800/257-6381); Central Point's Optimizer, which is part of MacTools Pro ($99; 503/690-8090, 800/937-9842); and Symantec's Speed Disk, which is part of Norton Utilities for Macintosh ($149.95; 503/334-6054, 800/441-7234). (Note: Use Speed Disk version 3.1; version 3.0 contains a bug that can damage data.)

If you have a reasonably fast Mac and a high-capacity hard drive, consider using FWB's Hard Disk ToolKit ($199.95; 415/474-8055), Casa Blanca Works' Drive7 ($79.95; 415/461-2227), or another special disk driver. These performance-tuning drivers can make a dramatic difference with fast Macs and high-capacity drives. For example, on my Quadra 840AV, Hard Disk ToolKit improved the transfer rate of a La Cie 1.2GB drive from 2MB per second to more than 3MB per second.

Solution 3: Run Lean If launching programs seems particularly slow, try pruning your font collection. Each application has to generate its font menu as it loads by scanning the System Folder for fonts—and the more fonts you have, the longer it takes. This phenomenon reaches its crescendo in Microsoft Word 6 because, according to Microsoft, the *continues*

application checks each font to ensure that it's not corrupted.

If you're on America Online or eWorld, visit the Macworld Online software library and download the text file Hard Drive Speedup Tips. It contains more background on optimizers and drivers and more details on steps you can take to boost hard drive performance.

Scrolling and Zooming Are Slow

Bottlenecks: (1) High video bit depths. (2) Complex graphics.

Solution 1: Lower Bit Depths I discussed this issue in January's column, so I won't go into detail here. Just remember: on color Macs, documents scroll and zoom faster, Finder folders open more quickly, and windows update faster when the Monitors control panel is set to display fewer colors or gray shades. Scrolling, zooming, and manipulating windows are probably the most common tasks you perform, so using lower bit depths (for example, 16 or 256 colors instead of thousands or millions) can make a significant difference.

Solution 2: Use Draft-Mode Display Many word processors and desktop publishing programs can display blank or gray boxes in place of graphics (a technique called greeking). Using draft-display mode speeds up scrolling and zooming significantly, especially with documents containing complex illustrations.

Printing Takes Too Long

Bottlenecks: (1) Too many foreground tasks. (2) Too many downloadable PostScript fonts. (3) Slow LocalTalk cabling. (4) Overly complex print jobs. (5) Slow printer.

Solution 1: Limit Background Printing System 7's background-printing feature lets you get back to work within moments after you send a file to print. However, that actually slows printing, since the Mac has to juggle the print job and your foreground activities. You can get your output a bit sooner by disabling background printing—but you'll have to twiddle your thumbs while the job prints. A better way is to avoid complex foreground tasks, such as using a modem or scanner, while a document prints in the background.

Solution 2: Download Oft-Used Fonts Your Mac automatically transfers downloadable fonts with a print job from the hard drive to the printer; the printer then purges them after it outputs the job. Each downloadable font takes up to 30 seconds to travel over LocalTalk cabling—and that bogs down traffic on your network.

If you start each day by manually downloading frequently used fonts with a program like LaserWriter Utility in-

cluded with Apple PostScript printers, the fonts stay in the printer until you restart it or turn it off (see "Manual Downloading Options"). That saves time and reduces network traffic, but it leaves less memory available in the printer for automatically downloaded fonts and for complex print jobs. Strike a balance by downloading only the few fonts you use most.

The best way to deal with downloadable fonts is to add a hard drive to your printer (if it accepts one). The printer can retrieve downloadables from the hard drive almost instantly. But don't delete the printer font files from your Mac's hard disk—if you use Adobe Type Manager you'll need them to get sharp on-screen text.

Solution 3: Use Ethernet Nearly all current Macs and many printers include built-in Ethernet, which can transfer files and fonts many times faster than can LocalTalk. Most people think of Ethernet as being suitable only for large networks, but its ability to spew data at warp speeds makes it ideal for even a one-Mac–one-printer network—particularly if you routinely print scanned images and downloadable fonts.

Solution 4: Simplify Print Jobs Printing requires extensive calculations to convert font outlines into characters of the required size, and to process the PostScript or QuickDraw instructions that describe images. The more fonts, type sizes, and images a document contains, the longer you'll wait to see it. This applies to PostScript and non-PostScript printers alike. You can cut printing times by using fewer fonts and type sizes in a document. (This isn't a bad idea from an aesthetic viewpoint, either.)

Solution 5: Print in Draft Mode As with scrolling, you can speed up printing by greeking images. If you're just proofing a layout, use the draft-printing option in the application's Print or Page Setup dialog box to print blank placeholders in place of the graphics.

Slow Multimedia Performance

Bottlenecks: (1) CD-ROM technology is just slow. (2) QuickTime playback demands different setup than do other uses of CD-ROM.

Solution 1: Optimize System Settings For QuickTime-movie playback, turn off virtual memory, file sharing, and the View control panel's Calculate Folder Sizes option. These steps will boost your Mac's overall performance, too. If you have an older, single-speed CD-ROM drive, consider upgrading to a double-speed model (Apple's drives are excellent). And if you aren't using QuickTime 2.0, try it out— it might help.

Solution 2: Use Caching Utilities A CD-ROM–caching utility—such as FWB's CD-ROM ToolKit ($79; 415/474-8055), Casa Blanca Works' DriveCD ($79.95; 415/461-2227), Shirt Pocket Software's SpeedyCD (602/966-7667), CharisMac Engineering's AutoCache ($79.95; 916/885-4420, 800/487-4420), or Insignia Solutions' RapidCD ($69.95; 415/694-7600, 800/848-7677)—can boost performance by stashing recently accessed data in memory or on the hard drive. If the data is needed again, it's retrieved from the cache instead of from the slow CD-ROM drive. (DriveCD lacks a disk-caching feature; it caches to RAM only. DriveCD can also block the display of icons on the CD, making a *continues*

AVOID POWER MAC SNAGS

Where Power Mac performance tuning is concerned, one area is of special concern: extensions and control panels that patch the Mac's system software. A number of utilities—from screen savers to keyboard enhancers—install patches; for example, CE Software's QuicKeys patches keyboard routines to work its macro magic.

But when patches are written in 680X0 code instead of native PowerPC code, they force Power Macs to spend more time in emulation mode and switching between emulation and native modes. That can really slow performance, even when you run native-mode applications. I've heard of cases where a single startup file caused as much as a 40 percent decrease in performance.

How can you tell if a given utility installs 680X0 patches? One way is to look for the "Accelerated for Power Macintosh" sticker on the software's box; if it's there, you can probably relax. Another way is to install Casady & Greene's Conflict Catcher II, a utility that can analyze extensions and detail which ones install 680X0 patches. It's a great way to tune the performance of a Power Mac. If you find an extension or control panel that patches over native code, you might want to stop using it until a native Power Mac upgrade is available.

Manual Downloading Options Apple's Laser-Writer Utility (top) lets you manually download fonts to PostScript printers. Manuel Velosa's shareware Startup Downloader (bottom) is more convenient—it allows you to create font sets you can download with a double-click.

disc's window appear much sooner on the Mac's desktop.)

CD-caching utilities also provide prefetch caches that guess which information the Macintosh will need next and read it into memory before it's required. For QuickTime-intensive CDs, prefetching can actually slow performance and cause jerkiness, but prefetching is very effective with other kinds of CDs, such as text archives.

Finally, if you have an older, single-speed CD-ROM drive, a caching utility will also bring your audio and Photo CD capabilities up-to-date. In particular, FWB's CD-ROM ToolKit has outstanding audio-CD support, including the ability to extract audio tracks and create disk files of their contents—an important feature for presenters and multimedia producers. ▥

Next month: Coping with font overload

BY LON POOLE

Quick Tips

Tips, Tricks, and Shortcuts

IN A FEW MINUTES YOU CAN SOLVE A problem that has plagued Macintosh users since day one—the customary but dumb method of removing a disk from the Mac by dragging the disk icon to the Trash. Michael Wiant of Alexandria, Virginia, suggests you simply make an alias of the Trash, change the alias's name to Remove Disk, and paste a custom icon in the alias's Get Info window. Make the custom icon look like a hand removing a disk or a disk with an arrow pointing in the direction of ejection.

Freeware in Macworld Forums
All the freeware utilities mentioned in this column are available in the Macworld forums of America Online and eWorld.

Generic Icons after Rebuilding
Q. When I rebuilt my desktop, all of my TeachText document icons went blank. What caused this, and how can I revert their appearance?

Jethro O. Miller
via the Internet

A. Maybe the Finder couldn't locate the documents' creator application while rebuilding the desktop database, so it substituted a generic document icon (a blank page with a corner turned down). Make sure TeachText or SimpleText is on the disk and rebuild the desktop again. If the application is not on the same disk as the document, make sure you rebuild the application's disk before you rebuild the document's disk.

If TeachText or SimpleText was present when you rebuilt, perhaps its bundle bit is somehow no longer set. (The bundle bit is an internal setting that designates that an application has nongeneric document icons.) Disk-utility software such as Norton Disk Doctor and Mac-Tools Pro, both from Symantec, can reset

bundle bits semiautomatically. You can also set a program's bundle bit with the Get File/Folder Info command in Res-Edit's File menu (check the Has BNDL option). Apple's Disk First Aid application fixes many disk problems but does not fix bundle bits.

Another possibility: if Super ATM 3.5 is installed when you rebuild the desktop, some icons become generic and some documents will no longer open when you

double-click them. Until you upgrade ATM, you can work around this problem by rebuilding with extensions off. Here's a one-pass method for System 7 users: hold down the shift key while restarting; when you see the message "Welcome to Macintosh Extensions Off," release the shift key and immediately hold down the ⌘ and option keys until another message asks if you want to rebuild the desktop on the start-up disk.

Desktop-rebuilding problems can also be the result of damaged desktop

files. Try clearing the desktop database with either of two freeware programs: Reset DTDBs 2.0 or TechTool 1.0.6, and then rebuild again.

If you have problems with a custom disk icon, try the freeware utility Disk Rejuvenator from Aladdin Systems. If you have problems with a custom folder icon, drag the folder's contents to a new folder and then drag the troublesome, now-empty folder to the Trash.

Recording from an Audio CD
Q. I own a Quadra 650 with an internal CD-ROM drive. Is there no way to capture audio directly from a CD, even in mono?

Joshua Dowd
Greenville, North Carolina

A. Unplugging the microphone is the key to recording directly from an audio CD in the internal CD-ROM drive of a Quadra or Centris 610 or 650, a Quadra 800, a Mac IIvx or IIvi, or a Performa 600CD. If the microphone is plugged into the port on a monitor, such as Apple's 16-inch display, then you must unplug the cable that connects to the microphone port on the computer. When nothing is plugged into the microphone port, those models record 8-bit monophonic sound (both stereo channels mixed together) from the internal CD-ROM drive. When something is plugged into the microphone port, those models take sound-input from that port. You cannot switch sound-input sources with the Sound control panel on those Mac models as you can on a

continues

Quadra 630, 660AV, 840AV, or 950; the LC or Performa 570CD series; or any Power Mac.

To connect an external CD-ROM drive's output ports to your Mac's microphone port, you need a patch cord that fits your Mac's sound-input capabilities (see *Quick Tips*, February 1995 and August 1994).

To record short segments of an audio CD, use the freeware utility GrabAudio by Theo Vosse. For a cheap way to record longer segments of an audio CD, see the sidebar, "CD Audio in Movies."

Balky Scrapbook
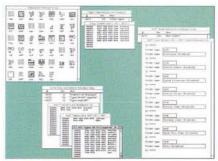
Q. Recently my Scrapbook wouldn't open; I heard a beep but saw no error message. I had to replace the Scrapbook file, which was 2.7MB and contained complex graphics. What went wrong, and how can I access the original Scrapbook file (which I saved)?

Todd R. Coogen
Hackettstown, New Jersey

A. If you recently upgraded to System 7.5, your Scrapbook became an application instead of a desk accessory. To see large pictures with the Scrapbook application, you must increase its memory size with the Finder's Get Info command. You'll have to experiment to find an optimum size, but start by increasing from the standard 256K to about twice the size of the largest picture in the Scrapbook. For example, if the Scrapbook contains a 259K picture (256 colors at 640 by 480 pixels), set Preferred Memory Size in the Scrapbook's Get Info window to 600K.

You can also access Scrapbook items with ResEdit, Apple's resource-editing application. First, open the Scrapbook file with ResEdit; then open a resource type (PICT for pictures, TEXT or styl for text, snd for sounds, moov for movies, and so on); and finally copy an individual resource, which corresponds to a Scrapbook item, for subsequent pasting elsewhere. The Scrapbook stores items as resources
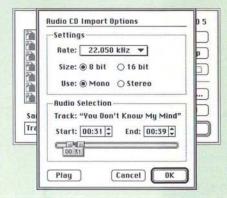
Extensions Manager Resource Changes
These ResEdit windows show the changes needed to make Extensions Manager 3.0 take control of the Control Strip Modules, Shutdown Items, Apple Menu Items, and Fonts folders.

CD AUDIO IN MOVIES

Here's an easy, inexpensive way to record a passage from an audio CD as a sound file. (Keep in mind that you should not copy sounds from a CD—as with any other copyrighted material—without first obtaining permission from the copyright holder.) First you make a sound-only QuickTime movie, and then you convert it to an ordinary System 7 sound file or an AIFF (Audio Interchange File Format) file. This procedure works with an AppleCD 300 CD-ROM drive but not with an AppleCD SC or AppleCD 150 drive, and it requires QuickTime 1.6 or later. You need an application that can open QuickTime movies, such as SimpleText 1.0 or later (Performa versions of SimpleText cannot open movies). You also need the freeware utilities Movie2Snd 1.1.1 by Scott Lindsey and SoundTrack by Manuel Veloso.

Choose Open from Simple-Text's File menu. In the directory dialog box that appears, open the audio CD, select the track you want to record, and click the Convert button. This brings up another directory dialog box, in which you name the sound-only movie and select a folder location for it. Clicking this dialog box's Options button brings up the Audio CD Import Options dialog box (shown here). Adjust the slider controls to specify which part of the audio track to include and set the sound-quality options. After dismissing the Audio CD Import Options dialog box, click the previous dialog box's Save button. QuickTime copies the audio data from the CD to the movie file. If you want a System 7 sound file, drag the movie file to the Movie2Snd icon in the Finder. If you want an AIFF file, drag the movie to the SoundTrack icon.

in the resource fork of the Scrapbook file. A resource fork can contain up to 2727 resources and is limited to 16MB.

Stuck in the Past

Q. How can I keep the time and date current? Every time I start up my LC, I'm sent back to 1956.

Bookman3
via America Online

A. Replace the lithium battery on the system board. The battery is next to the internal hard disk (SCSI) connector on the LC. When the Mac is off, the battery keeps the clock ticking and powers the parameter RAM (PRAM), which stores settings for many control panels, including Mouse, Keyboard, and Startup Disk. You could get the battery from a Macintosh dealer and replace it yourself, but you should consider having a technician do the work, since the system board can easily be damaged by static electricity or incorrect handling.

Enhancing Extensions Manager 3.0

TIP Many people who upgraded to System 7.5 were undoubtedly disappointed with the new Extensions

Manager 3.0. Compared with version 2.0.1, which is still distributed online as freeware, version 3.0 has a better interface but less functionality. It no longer controls fonts, start-up items, or Apple-menu items; and the advanced Customize File Types feature is gone. Here are a few ResEdit tricks that restore the lost abilities to version 3.0. In fact, you can go beyond version 2.0.1 by adding control of items in the Control Strip Modules and Shutdown Items folders.

You begin by duplicating Extensions Manager 3.0 and opening the duplicate in ResEdit. To add folders you must edit two types of resources, FTyp and fld#. For example, the following steps describe how to add the Fonts folder:

1. Open the FTyp resource -4033 to bring up a resource-editing window for it. In that window, click an insertion point at the end of the text in the rightmost column and type **fontfonD**; here and elsewhere in ResEdit, carefully observe capitalization and don't press return.

2. Open the fld# resource -4033 and in its resource-editing window click the last numbered separator (*****) to select it. Choose Insert New Field(s) from the Resource menu, press tab to advance to

More Extensions Manager Folders

Folder Name	FTyp -4033	Folder Type	Folder Name
Extensions	extnextD	extD	Extensions (Disabled)
Control Panels	ctrlctrD	ctrD	Control Panels (Disabled)
System Folder	macsmacD	macD	System Extensions (Disabled)
Control Strip Modules	sdevsdvD	sdvD	Control Strips (Disabled)
Shutdown Items	shdfshdD	shdD	Shutdown Items (Disabled)
Startup Items	strtstrD	strD	Startup Items (Disabled)
Apple Menu Items	amnuamnD	amnD	Apple Menu Items (Disabled)
Fonts	fontfonD	fonD	Fonts (Disabled)

Make Extensions Manager 3.0 control more than the first three folders listed here by adding to its resources with ResEdit. For each additional folder, add the text listed here to FTyp resource -4033 and to new fields in fld# resource -4033.

the Folder Type field, and type **fonD**. Press tab again to advance to the Folder Name field, and type the two words **Fonts (Disabled)**.

To add more folders to Extensions Manager 3.0, repeat the two steps above with other values from the table, "More Extensions Manager Folders." Note that you can change the order in which Extensions Manager lists folders by changing the order of the 8-character entries in the FTyp resource.

You're not quite done yet, because Extensions Manager displays only files whose file types are listed in the iNIT resources -4033 or -4034. Some important omissions are the file types for sound files (sfil), AppleScript scripts (osas), Control Strip modules (sdev), and components such as Apple Photo Access and MacinTalk Pro (thng). In addition, Extensions Manager includes the file type for font suitcases (FFIL) but not for individual TrueType fonts (tfil), bitmapped fonts (ffil), or PostScript fonts (LWFN). Open iNIT resource -4034, and at the end add the additional file types you want Extensions Manager to list. You must also doctor iNIT resource -4035, which lists the 4-character creator codes of files not displayed by Extensions Manager. Delete the DMOV creator from this resource so that you will be able to see all font suitcases listed in the Fonts folder (to do this, select the DMOV characters and press the delete key). The screen "Extensions Manager Resource Changes" shows the state of the iNIT, fld#, and FTyp resources with all the changes listed in the table, "More Extensions Manager Folders," in place.

Even with all these changes, you'll see only the system extensions and control panels that have INIT resources. Those resources—not to be confused with iNIT resources—contain software to be run during start-up. If you want Extensions Manager to list all control panels, you must delete file type cdev from the iNIT
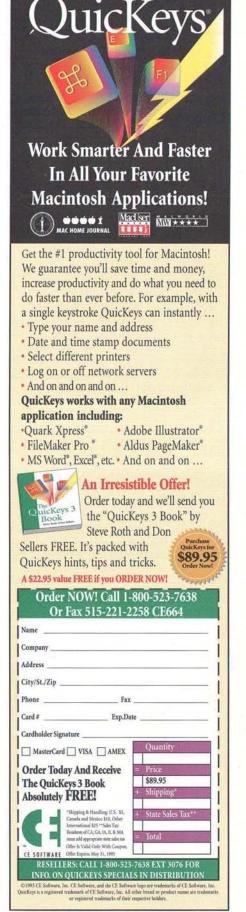
resource -4033. Delete file type INIT from that resource if you want Extensions Manager to list all system extensions. These last two changes won't have any effect unless you make one more change: open the cdev resource -4064 within Extensions Manager 3.0. In the editing window for that resource, scroll down until you see 000F00 in the leftmost column. Then look to the right across that row for 80 and change it to 00.

When you have finished making all the changes, save the Extensions Manager and quit ResEdit. Test your changes by double-clicking the modified version of Extensions Manager 3.0. Scroll through the file list and make sure everything appears as you expect. If a file does not show up, add its type to the iNIT resource -4034; you can determine a file's type with the Get File/Folder Info command in ResEdit's File menu. When you are satisfied with your new Extensions Manager, put it in the Control Panels folder and enjoy the enhanced features you have added.

William S. Peters
Salt Lake City, Utah

If you'd like to use System 7.5's Control Strip on a desktop Mac, use Robert Mah's Control Strip Patcher freeware utility. In case you haven't seen it on a PowerBook, Control Strip gives you immediate access to many control-panel settings.—L.P. **m**

We pay from $25 to $100 for tips published here. Send questions or tips on how to use Mac computers, peripherals, or software (by mail or electronically) to *Quick Tips,* Lon Poole, at the address listed in *How to Contact Macworld* at the front of the magazine (include your address and phone number). All published submissions become the property of *Macworld*. Due to the high volume of mail received, we're unable to provide personal responses.

LON POOLE answers readers' questions and selects reader-submitted tips for this monthly column. His latest book is *Macworld System 7.5 Bible*, third edition (IDG Books Worldwide, 1994).

Networks

THE LATEST IN CONNECTIVITY AND COMMUNICATIONS

ISDN Heats Up

DAVID KAHL

AS TELEPHONE COMPANIES RAPIDLY deploy ISDN (Integrated Services Digital Network) throughout the United States, Europe, and Japan, Macintosh users are finally finding ISDN a popular route to cheap, high-speed communications. For as little as $22 per month, an ISDN line provides two 64-Kbps data channels that can be combined, or bonded, into a single 128-Kbps channel—four times as fast as today's fastest modems. Equipment prices are dropping, too, with some products costing less than today's fastest modems.

Network managers put ISDN to work for three key applications. The first is point-to-point BBS and file transfer; a bonded ISDN connection can move a 10MB image file in less than 15 minutes—an hour-long chore using the fastest available modem. Second, ISDN works well for dial-on-demand network bridging, for example, to let a branch office or telecommuter access a LAN with vastly improved performance. When traffic needs to move between LANs, the bridge automatically establishes a link—more quickly than Apple Remote Access can. The third key application, high-speed Internet access, also takes advantage of ISDN's dynamic connection and bandwidth-on-demand to let users appear to have a full-time Internet presence.

ISDN service costs less than other high-speed digital connections, such as digital data service and frame relay. ISDN service charges range from Pacific Bell's Home ISDN in California for $22 per month plus 1 cent per minute for local daytime calls, to other providers' rates of up to $100 per month or 4 cents per minute. Long-distance rates are the same for ISDN calls as for voice calls.

ISDN equipment prices range from $500 for so-called ISDN modems to several thousand dollars for multiline ISDN

routers and bridges. Every ISDN connection requires a *network terminator* (NT1), a black box that provides an active end point for the ISDN line, and a *terminal adapter* (TA), an interface between the ISDN line and computer equipment. Stand-alone NT1s cost between $150 and $500 and may include extra features, such as ports for analog phone lines. Com-Net Industries' (CNI) bare-bones WindRider NT1 costs $150 on the street; IBM's 7845 NT1 costs $350 on the street and includes an analog phone port with features such as conference calling and speed dialing.

Some TAs have a built-in NT1. For example, AccessWorks Communications' QuickAccess ($400 to $650 street price) includes the NT1; it connects to a Mac's serial port and appears to the Mac as a high-speed modem—hence the term *digital modem*. Competing ISDN modems include Motorola's HTMA-200 ($500 street price) and Adak Communications Corporation's model 221 ($550 to $700

street price). Service bureaus can combine an ISDN modem with an ISDN-capable BBS package, such as SoftArc's First-Class, to provide customers with convenient high-speed file exchange.

Not all Macs have serial ports capable of 128 Kbps or even 56 Kbps. The serial ports on Quadra AV models and Power Macs can sustain speeds of up to 250 Kbps. Other Macs need an add-on card for ISDN connections.

A NuBus serial card, costing $100 to $200, makes it possible for a Mac with a slow serial port to talk effectively to an ISDN TA. Or consider an ISDN NuBus card, which lets you connect an ISDN line directly to your Mac. (All current ISDN NuBus cards require an external NT1.) ISDN NuBus cards support software routing of AppleTalk and TCP/IP traffic to the local network. The Planet ISDN board from Euronis has a street price of $750 and includes an analog phone port. You can put up to six boards

in a single Mac to support multiple ISDN users or to provide bandwidth-on-demand. A software package called The Link, $595 list price, from Euronis, bundles Apple's Apple Internet Router software with ISDN drivers to let you bridge traffic between Mac networks.

ISDN-capable bridges now cost no more than ISDN NuBus boards. The bridges connect directly to an Ethernet network and automatically move Apple-Talk and TCP/IP traffic across an ISDN link. The Pipeline 50HX ISDN bridge/router from Ascend Communications has a street price of $800 and provides an integrated NT1, 128-Kbps bonding, dynamic connections, and bandwidth-on-demand. A similar unit from Combinet, the Everywhere CB-160, costs $950 on the street.

For sites that need multiple-user or higher-speed connections, Combinet and Ascend sell multiline ISDN bridges and routers that support bandwidths beyond 128 Kbps, at list prices ranging from $2000 to $7000.

AccessWorks, 908/721-1337; Adak, 517/882-5191; Ascend, 510/769-6001; CNI, 818/767-4440; Combinet, 408/522-9020; Euronis, 407/363-9008; IBM, 800/426-2255; Motorola, 205/430-8000.—MEL BECKMAN

Vendors Outline 100-Mbps Strategies

CONSENSUS IS BEGINNING TO EMERGE on the 100-Mbps Ethernet debate. The largest players in the Macintosh Ethernet-card market—Apple Computer, Asanté Technologies, and Farallon Computing—have outlined product strategies that include supporting the emerging IEEE 802.3 100BaseT standard called Fast Ethernet. All three companies plan

ROB DUDLEY

to ship PCI (Peripheral Component Interconnect) 10/100-Mbps cards, which support both Ethernet speeds, when Apple ships PCI-based Macs in the second quarter. Specifically, the cards will be based on 100BaseTX, the part of the proposed standard that specifies category 5 unshielded twisted-pair cable. 100BaseTX combines the FDDI signaling scheme with standard Ethernet protocols to achieve 100-Mbps bandwidth.

When its PCI systems ship, Apple will offer 10-Mbps Ethernet, 10/100-Mbps Ethernet, and 4/16-Mbps Token Ring PCI cards. Later in the year, Apple

plans to offer more PCI cards including an FDDI card, a multiport serial card, and 25-Mbps and 155-Mbps ATM cards.

Asanté plans to release a 10-Mbps PCMCIA card, a 100BaseTX PCI card priced under $300, and a nonswitching 100BaseT hub in the first half of the year. In the third quarter, the company will take advantage of its own ASICs to produce a 10-Mbps Ethernet switch priced under $200 per port; later in the year, an optional dedicated 100-Mbps connection will be offered for the switch. (Switching guarantees a network device dedicated bandwidth.) Asanté is also developing a cell-switched architecture, which will support ATM up to 155-Mbps and 10/100-Mbps Ethernet switching; stackable hubs based on this architecture will debut in the second half of the year.

Farallon will offer 100BaseTX cards based on technology licensed from 3Com Corporation. A NuBus card will ship in the spring, followed by a PCI card for Power Macs in the summer. Farallon also intends to ship a 100BaseTX workgroup hub and a bridge by the end of the year. Pricing was not set at press time.

Apple Computer, 408/862-3385; Asanté, 408/435-8388; Farallon Computing, 510/814-5100.—E.D.

Utility Encrypts AppleTalk Data

ATEMI SOFTWARE'S NIGHTSHADE foils eavesdroppers by encrypting data on AppleTalk networks. NightShade is the first software-only product that automatically and transparently encrypts all Mac-to-Mac AppleTalk traffic.

NightShade protects all AppleTalk

applications, including AppleShare and System 7 file sharing. Network data is encrypted using the DES (data encryption standard) or Triple DES algorithms, or NightShade's own encryption system, designed for minimal impact on network performance. Macintoshes running NightShade can still communicate with unprotected systems.

For one user, NightShade lists for $199 for Atemi's encryption scheme, $99 for DES, and $99 for Triple DES. A two-user Apple Remote Access pack, priced at $399, includes all three encryption approaches. Volume discounts are available. The company expects to ship versions for Novell's NetWare for Macintosh, IPX, and TCP/IP in April. Atemi Software, 217/352-3688.
—JOEL SNYDER

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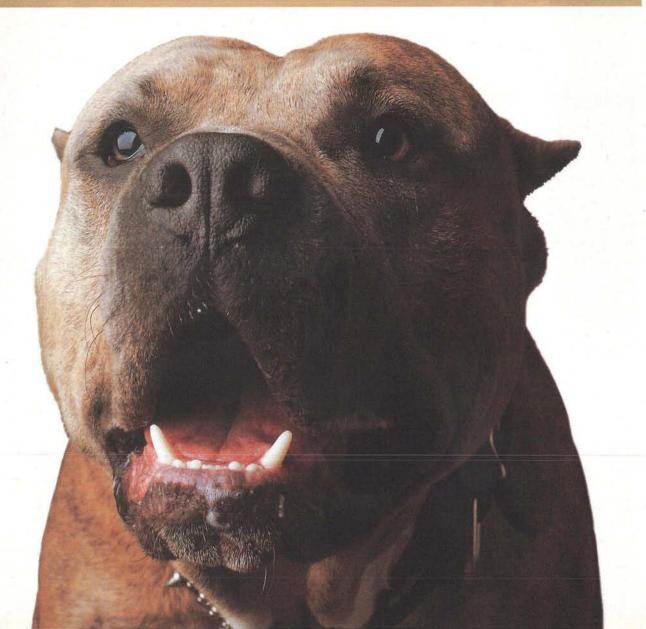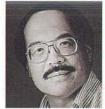
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Circle 217 on reader service card

Need to look-up all the vets in Virginia? This will leave you drooling.

BY CARY LU

PowerBook

Notes

PowerBook Repairs

IF YOU HAVE TROUBLE WITH YOUR PowerBook, you should first consult Apple's *PowerBook Troubleshooting Guide*. This excellent 100-page booklet comes with recent PowerBooks and covers most common hardware and software problems for all models. But Apple says it has no way to get copies to owners of older PowerBooks.
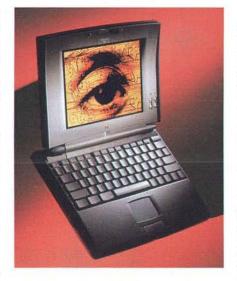
If you can't get a copy of the booklet or if it doesn't help you solve your problem, try user groups, online forums, or your dealer. Another source of information is the SOS-APPL line (800/767-2775), which generally offers good advice, though you may have a long wait before you talk with a support person.

Diagnostic Software

Apple Personal Diagnostics (from Apple) and MacEKG (from MicroMat Computer Systems, 415/898-6227, 800/829-6227) run various hardware tests, and each sells for about $100. MacEKG supplies more-detailed testing information, telling you which section of the motherboard circuits are faulty, while Apple's software simply gives an overall thumbs-up or -down for the entire motherboard. You probably won't find either product very useful, since PowerBooks (or indeed desktop Macs) rarely suffer from the kinds of problems these programs diagnose.

Doing It Yourself

Should you repair a PowerBook yourself? Only if you know exactly what you are doing. Opening a PowerBook does not void the warranty, but you are responsible for any damage you may cause. Every repair shop has seen PowerBooks damaged by users who tried to perform repairs or upgrades themselves. PowerBooks

contain much smaller and more-fragile components than do desktop computers. While the 100-series models are fairly easy to open up and work on, Duos are harder, and the 500-series models are exceptionally difficult to service. Pre-Owned Electronics (617/275-4600, 800/274-5343) stocks many PowerBook parts.

Consumer-electronics companies publish excellent service manuals for TVs and stereos, complete with circuit diagrams and detailed diagnostic information, but Apple does not publish anything remotely comparable for its computers. Apple's Service Source CD-ROM, available only to authorized repair centers, explains how to take apart any Mac, but its service information is limited to basic symptoms and subassembly replacement. It contains no circuit diagrams and describes no component repairs. Occasionally, old copies of this CD-ROM turn up at computer flea markets.

Anyone can browse Apple's technical-information library, available through several online services and the Internet (http://www.info.apple.com/til.html). Although it's a useful resource for technical notes, this library has little service information. Separate from Apple's offerings, you can find some service information written by users on the Internet; connect via FTP to an info-mac archive (ftp://mrcnext.cso.uiuc.edu/pub/info-mac, ftp://ucs.ubc.ca/pub/mac/info-mac, ftp://hawaii.edu/mirrors/info-mac, and others) and browse the info/hardware folder. Global Village Communication's installation guides for its modems contain excellent PowerBook disassembly and assembly instructions. If you have a Global Village modem, you can get a guide for free if you sign an agreement that you will not hold the company responsible for anything you do to your PowerBook (see Global Village Communication's online support areas or call 408/523-1000). These guides deal only with modem installation; they don't explain any other process or how to do a complete disassembly.

Choosing a Repair Shop

If your PowerBook is broken and the problem is covered by the warranty, calling SOS-APPL is the best choice. You have to ship your PowerBook to Apple, parting with it for at least a few days, but the overall repair time is often less than at a local Apple-authorized service center. Always back up any critical files before turning over any computer to be serviced; consider deleting sensitive files.

If your PowerBook is out of warranty, damaged by accident, or if you *continues*

are in a great hurry, you can take it to an independent repair shop. The independents tend to work more quickly, and for some common repairs they charge much less than Apple-authorized service centers do. But not all repair places do good work, so to find a competent independent repair shop, check with a local user group first. (For a partial listing, see "Some Repair Shops.")

The Most Common Repairs

All prices include parts and labor.

Screens PowerBook displays rarely go bad by themselves—a good thing, since they are expensive to replace ($300 to $500 for passive matrix monochrome, $800 to $900 for active matrix gray-scale, and nearly $2000 for active-matrix color). A scratched screen cannot be repaired, only replaced. The backlight should last for 10,000 to 15,000 hours (5 to 7 years at 40 hours per week); over this time, the brightness will drop by 50 percent—noticeable but usually not a problem. A replacement backlight costs about $150. If the screen on a PowerBook 140, 145, or 170 flickers, intermittently goes black, or displays two horizontal black lines, try squeezing the right side of the bezel. If the image changes, you need a shim installed in the video connector ($75).

Keyboards and Trackballs Duo and 500-series keyboards can behave erratically if the fastening screws are too tight or too loose. The keyboard screws are readily accessible from the bottom of the case. You can loosen or tighten them slightly with a Torx T-8 screwdriver. For the 500 series, you need a real T-8 screwdriver because the common T-8 tips for ¼-inch hex-shaft screwdrivers won't reach the screws.

Trackballs need regular cleaning but otherwise rarely fail. Broken trackball switches may require trackball replacement, about $140.

RAM Cards Some vendors have failed to follow Apple's specification for RAM cards. On 100-series PowerBooks, a memory card may work for several months, and then its contacts might fail through shock and vibration. For the 500 series, Apple specifies low-profile memory chips in SOJ (Small Outline, J lead) packaging for the RAM cards. Some companies use the slightly higher TSOP chips (Thin Small-Outline Package), which don't fit properly in the PowerBook and can even bulge out the keyboard. The problems typically show up as random software errors. Apple says memory cards for Duos rarely cause problems.

Motherboards Only two components on a PowerBook's motherboard are usually practical to repair: the battery fuse

and the connectors. A 100-series Power-Book with a blown fuse will run off an AC adapter but not on battery power (check first to make sure the problem isn't the battery itself); loose connectors work intermittently and are particularly common on the PowerBook 100. In both cases, an Apple-authorized service center will replace the motherboard for between $300 and $500. An independent shop will replace the fuse or resolder the connectors for about $50 to $90.

AC Adapters The AC adapters for early 100-series PowerBooks had plugs that were prone to fail. The plastic insulation in the coaxial connector that plugs into the PowerBook tended to crack, producing a short that would blow the battery fuse. Apple will replace such defective AC adapters and repair the PowerBook without charge (even if it's out of warranty), but only if the adapter is demonstrably faulty. For this specific problem, an authorized service center is always a better choice than an independent.

Duo Battery Contacts If a Duo with a good battery shuts down (not sleeps) unexpectedly, won't start from the battery, won't charge the battery, or turns off intermittently, the battery contacts need to be realigned. Apple makes a special tool for this process, which requires opening the Duo. You should ask for the realignment whenever you have your Duo serviced. Battery contacts on other Power-Book models have much better designs.

All PowerBooks except the Power-Book 100 have a backup battery on the motherboard. Apple says that battery should last the life of the PowerBook; Apple has not seen any failures yet. (Back-

up batteries for the 100 are standard lithium cells available from many stores.)

Disk Drives A defective hard or floppy drive must usually be replaced, since neither can be repaired practically. You can sometimes isolate a misaligned floppy drive by keeping careful records of which drive has written on specific disks. The best way to test alignment is by using Accurite Technologies' MacDrive Probe (408/433-1980). It measures the alignment accuracy of a drive, unlike competing programs, which report only good or bad (a moderately misaligned drive will test as good). The program runs only on 68030 Macs: 100-series PowerBooks and Duos from the 210 through the 270c. Unless you manage many PowerBooks, the $149 price for MacDrive Probe may be too high; for $235 you can get a new drive installed. Incidentally, the Power-Book floppy drives are extremely difficult to realign.

Hard drive problems can sometimes be cured by reseating or replacing the cable. Otherwise, hard drives should be replaced rather than repaired. Many companies can do data recovery from balky or damaged hard drives; see the ads at the back of this magazine.

System Software Problems Apple says the only incompatibility among its system software products is with Power-Book File Assistant 1.0, which should be upgraded to the current version, 1.1.

Extended Warranties

AppleCare is an extended-warranty program for Apple products; you pay about 10 percent of the purchase price per year. Is AppleCare worth the cost? Probably not. Extended warranties are essentially insurance policies. The chances that you will need the extended warranty are pretty low, so you will almost always be better off taking your chances. Besides, AppleCare covers only repairs for defects, not accidental damage or loss through theft or natural disasters. SafeWare (614/262-0559, 800/848-3469) sells a Fix-It policy that includes both repairs and loss from theft or accident for 7 percent of the replacement cost per year, with a $50 deductible. (For theft and accidents only, SafeWare offers a $69 annual policy that pays up to $5000, also with a $50 deductible; a rider on your business or house insurance policy may be cheaper still.) Better yet, you may already have an automatic extended warranty—if your Power-Book was purchased with one of the credit cards that offers such warranties. ▥

CARY LU is a *Macworld* contributing editor who covers mobile- and remote-computing issues in this monthly column.

El Cheapo Multimedia

Lights, camera, action—as shareware

ISTEN, WHEN I WAS YOUR AGE, we didn't have CD-ROM. We didn't have QuickTime movies. We didn't have self-running slide shows with thundering sound tracks. We had text files, and we were happy.

But Apple, much ridiculed when it first began hyping multimedia as the Next Big Thing, turns out to have been right. Today, even the feeblest computer Apple sells can crunch video as easily as numbers. And CD-ROM is so popular that you can't show your face at a cocktail party without knowing what Myst is.

Perhaps the biggest clue that multimedia has hit the mainstream, though, is that hundreds of sound, graphics, and video programs have appeared as shareware. When you can get a $15 shareware program that duplicates the features of some $400 or $800 commercial software, you know multimedia has arrived. Here are the best of the penny-pinching alternatives. (Unless otherwise noted, all are available only by modem, not by mail.)

Peter's Player 1.1
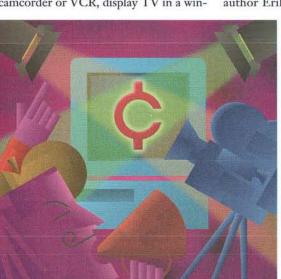
Want to sample the world of QuickTime digital movies without spending much? Download this polished, simple movie player. For *playing* QuickTime movies, it's far superior to Apple's own Movie-Player. For example, Peter's Player has the good sense to hide such distracting screen elements as the menu bar, the standard QuickTime scroll bar, and even the rest of your desktop (by blacking it out) when playing back your movies. In short, it turns your screen into a big black frame and makes your private screenings dramatic. If you have a Power Mac, it's accelerated, too. One caveat: Peter's Player is for playback, not editing. If you want to copy and paste, read on. (Available online, or send a disk and $20 to Peter Lee, 39 Canton Ave., Amherst, MA 01002.)

MoviePlay 2.0

It's a nearly perfect clone of Apple's MoviePlayer, and it's nearly perfect. MoviePlay's big bonus is the Copy and Paste commands; you can rearrange scenes exactly as you can with Movie-Player. Actually, the bigger bonus is that MoviePlay is free online. (From Motion Works, the Cameraman people.)

MovieTrilogy 1.1.1

The name is a charming misnomer; MovieTrilogy is a suite of *five* programs. (1) DeskTopMovie is a fascinating movie player, capable of slow and fast motion, speaking any text track (on speech-ready Macs), adding (or recording new) sound tracks to existing movies, and more. (2) DeskTopText makes scrolling-credit QuickTime clips (alas, not smoothly; but see below). (3) DeskTopTV is for AV-model Macs only (so I didn't test it). But it's supposed to record video from your camcorder or VCR, display TV in a win-

dow, let you add subtitles, and so on. (4) ScreenMovie records a movie of what you're doing on the Mac screen—including your spoken narration, if you have a microphone. The bigger the screen, the jerkier the playback, so you may need a high-horsepower Mac to make this practical. But for training and demos, it's the greatest. (5) QuickMovie, described later. The last two programs are separate downloads but considered part of the trilogy.

These programs don't show the standard QuickTime scroll bar, so navigation

is a little awkward. And there's no manual (*yet*, says author Paul C. H. Ho). But these modules do things no other programs can do. (Available online; send $30 shareware fee—or for disk send $40 to P.O. Box 87042, Village Square Postal Outlet, 2942 Finch Ave. E, Scarborough, Ont., M1W 2T0 Canada.)

CreditMaker 0.ß6

This free one-trick pony creates scrolling credits. Type up text in a text file, choose a font, specify the scrolling speed, and save. It's done: a new QuickTime movie file is on your disk, ready for adding to your other movies. There's no way to vary the text styling from line to line, but for "a little hack I wrote one night when I should've been studying for finals" (as author Erik Walter calls it), it's darned useful. Available online only.

QuickTime 2.0 and QuickMovie 1.0b2

The world hasn't made nearly enough fuss about the latest astonishing release of QuickTime from Apple. Yeah, yeah, it makes your movies play twice as smoothly; whatever. But the real news is the music.

You see, QuickTime 2.0 has an accompanying file called QuickTime Musical Instruments (see "Making Music with QuickTime 2.0"). This extension contains 30 instrument sounds from a Roland synthesizer. You can create orchestrated music, completely forgetting that the previous Macintosh sound limit was four notes at a time in a cheesy Casio-organ sound.

Start with a MIDI file, available by the thousand on America Online and elsewhere (or record your own, if you're a MIDI jock). Using the Get Info command within Apple's MoviePlayer, you can assign each of the MIDI file's tracks to one of the 30 instrument sounds. The result is a QuickTime movie, with video *continues*

or not, that plays amazing, rich, realistic instrumental music. And it doesn't take up much room on the disk, as a digitized Mac-mike recording would.

So you don't *have* Apple's MoviePlayer? Use QuickMovie, part of the above-mentioned MovieTrilogy. It has the same MIDI-track-to-instrument feature in a much simpler format. Just choose the MIDI Arrangement command, and you're in business. The music business.

SoundEffects 0.9

This Italian import, Alberto Ricci's SoundEffects ($15 requested), is a sonic Cuisinart—a sharp-looking, flexible work-alike of Macromedia's $249 Sound-Edit Pro. It displays the sounds you've recorded (using a MacRecorder or a Mac microphone) as sound waves, which you can cut, copy, and paste. You can add as many parallel channels of sound as you want, and they all play back together. Trust me: you don't know how much fun the Mac can be until you try recording duets and quartets with yourself.

With a name like SoundEffects there'd better be some FX, and there's a whole menu of 'em. You can amplify, echo, filter, fade out, play backward or— my personal fave—turn your voice into a hollow-sounding robotic monotone. Oh, about that version number: it's 0.9 because Undo doesn't work. Oh well.

LinksWare 3.0.4

OK then, you've recorded your sounds, scanned your photos, edited your movies. *Now* what?

LinksWare, that's what. It's an authoring system—a program that serves as Mission Control for all your multimedia snippets. Click one spot, and a picture appears. Click another spot, see a movie. Click over here, and a window full of text appears.

For comparison, the authoring system Macromedia Director goes for $1195. It's a silly comparison; Director has a hundred times more features than LinksWare. But Director is also a thousand times more complicated. In LinksWare, here's how you create an interactive presentation. Design a home-base screen: a dazzling Photoshop image, say, with buttons you've painted on. Then, in LinksWare, you drag across each area of that painting you want to be a button. Immediately you're shown an Open File dialog box, and you select the document—a picture, movie, sound, even a word processor document—you'd like to appear when that button is clicked. That's it: instant interactivity.

It gets better. The documents that appear when you click on a button may *themselves* have linked buttons, which can call up other documents—you can create a World Wide Web on your own hard drive. It's hypertext, hypergraphics,

Links Where? The world of LinksWare: Click on a phrase—and a picture, article, sound, or movie happens. For added user-friendliness, the trigger words have been set in boldface.

hypereverything. Plus, words or even phrases in a word processor document can serve as buttons. (The included XTND extensions let LinksWare read files from Word, ClarisWorks, and so on.)

LinksWare is so cool that I had difficulty believing it wasn't a commercial program. Surprise: It is, more or less. A four-link demo version is available online; call programmer Tracy Valleau (408/372-4155) and promise to send $49, and he'll give you a code that turns your version into the full-fledged one temporarily. When you pay, you'll get a code that gives you the full version permanently.

PICTShow 2.2

If a multibutton, multimediac LinksWare experience is overkill, consider a simple multimedia slide show. You hand PICT-Show a folder full of QuickTime movies, sounds, and PICT and GIF files. Specify the order. Tell it whether you want to click the mouse to advance "slides" or have the program do it automatically.

Then click on the Show button. The screen darkens, your first movie or picture fades in, and the crowd is in the palm of your hand. It's like Microsoft Power-Point, give or take $400. PictShow is your versatile, polished ticket to quick, inexpensive presentations. And author Oliver Dreer, Swiss gentleman that he is, asks for naught but a postcard in return.

The Upshot

If there's even one recessive creative gene in your body, almost nothing is more fun than twisting your own voice, music, and home movies into personal works of art using these programs. Especially when you got them free (or supercheap). All of these programs are in the Macworld areas of America Online and eWorld. Download, digitize, enjoy. **m**

MAKING MUSIC WITH QUICKTIME 2.0

To get terrific sound tracks without clogging your hard drive with digitized sounds, you need QuickTime 2.0, as described in this column. But where do you get QuickTime and its Musical Instruments? Apple doesn't make them available to the public, except as part of System 7.5 (and even then, only the CD-ROM edition includes Musical Instruments—not the floppy disks). So how do you get these files?

Well, various books and software programs include it. The least expensive is Christmas Lights, a merry little $19.95 program from Atticus Software Corporation (203/348-6100), which even includes Musical Instruments.

But if you have a modem and America Online, you can get QuickTime 2.0 for no more than the cost of some downloading time. You'll have to take a lot of user-unfriendly steps, but you'll wind up with a genuine, legitimate copy of QuickTime 2.0 (and its accompanying PowerPC and Musical Instruments extensions). Here's how.

1. From AOL's Go To menu, choose Keyword.

2. Type **rasterops**. Press the return key.

3. Double-click on the Software Library icon. Download the file called Video Installer 3.0. It takes 30 minutes at 14.4 Kbps (about $1.50 in connection time).

4. Double-click on the resulting .sea file; save it onto your desktop. You wind up with three files known as disk images. To turn these files into actual floppy disks, you need yet another program—a disk-image utility, such as DiskCopy, Mount-Image, or MungeImage. All three are also on America Online; use the keyword **quickfinder**, type **DiskCopy** (or whatever), and press return.

5. Once you've finally converted those images into actual floppy disks, you'll find the three QuickTime components in folders called Apple extensions.

The world of MIDI music is now open to you—no synthesizer required.

Contributing editor DAVID POGUE wrote *Macs for Dummies,* now in its third edition (IDG Books Worldwide, 1995). He just ended ten years of the ultimate multimedia experience: living in New York City.

The Palmtop Blues

Of Newton and Magic Link, Marco and Envoy

THEY'LL BREAK YOUR HEART every time. PDAs. You want them to work. You want them to be lightweight, easy to read, and capable of accepting simple input. You want them to be able to handle your schedule, store your phone numbers, and make your appointments—all while coordinating these details with that mother-ship computer on your desktop. You want them to be able to handle your mail, all of it. You want them to do what they do, without wires.

But the Rolling Stones had it right, in their 1968 paean to personal digital assistants: you can't always get what you want. If we were prone to accept this truism and wait until the millennium for PDAs to fulfill their promises, the case would be closed. But we keep hoping that, somehow, the current Newtons and Magic Links of the world might give us what we need. Right now. Our hearts flutter as we hear the promises, and again as we grasp a sleek new device in our sweaty little palms. And for a moment, we are bowled over. After all, these are marvels of technology, miracles of silicon, C code, and sweat. Look what they do!

And then we try to use them. And find they do not do things well enough. PDAs will always break your heart.

Newton Redux

Are PDAs useless? No, not at all. If it were so, Newton would be dead by now, and the rumors of its death have been exaggerated, if not greatly. To the surprise of observers who expected the executive chop squad now running Apple Computer to summarily ditch the Newton, Apple is not only supporting its ill-launched device but has also introduced a new version, the MessagePad 120. This is the third iteration, following the hasty fixes that made the MessagePad 110 marginally superior to the first issue, the 100. The changes run from the cosmetic (an improved lid to cover the screen) to the substantial (a desperately needed boost in RAM, up to 2MB). At $699, the sticker price is still high, but one can find

the first model, the slickest trash around, for as low as $200.

But the best news is in software. Now that the Newton is approaching the ripe old age of two (and considering the ridicule that came from "Sculley's folly," this is an achievement in itself), it finally boasts a reasonable number of third-party applications. My favorite used to be a program called Fingertip for Stats (Fingertip Technologies), which accessed the daily performances of various baseball players, but for obvious reasons you don't hear much about that one these days.

While some of these applications are directed to the consumers who were supposedly the original audience for the Newton, Apple has successfully cajoled some big companies into developing vertical applications for the palmtop. Among

those developers are Brigham & Women's Hospital, Standard & Poor's, and the Voice of America. The key to making a good specialized Newton application, of course, is eliminating the occasions where handwriting input is required. (In many cases this can be done through the use of a series of screens that allow you to check things off rather than actually create text.)

Still, using a Newton almost always requires that at some point you have to get text into the box. As handwriting

recognition goes, the Newton does quite a good job—better and better with every version. But this is like saying that a plane almost made it to its destination. Every time I use the Newton I am impressed that it makes even the slightest sense of my scrawl. But when I am less focused on the contemplation of technological tricks and more concerned with doing work—even entering an address or a short note—I find that the Newton becomes a frustrating parlor game, twisting my input into improbable misinterpretations. It breaks my heart.

Now, Palm Computing, maker of a Newton program called Graffiti, asserts that its product will allow you to flawlessly input text into the device. But Graffiti requires you to alter the way you print, writing some letters in weird, neo-hieroglyphic fashion. In other words, change the way you write. Sorry. I have a near-religious belief that machines should adjust themselves to my behavior and not the other way around. I think that sooner or later, the Newton's designers are going to have to figure out another way for it to accept input. Only then will people be able to appreciate the elegance of its interface and the sound thought behind its operating system.

Magic at Last?

Newton's biggest competitor is the Sony Magic Link, the system created by a company called General Magic. There is sort of a soap opera back-story here, in that Apple's Newton team was led by Steve Capps, one of the original Mac team, while the rival General Magic development team was headed by charter Mac wizards Andy Hertzfeld and Bill Atkinson. There are several striking differences between a Magic Link and a Newton. There are also many similarities: both have clocks, calendars, and phone lists. Both have *continues*

infuriatingly dim screens. Both cost too much. But at $995 for a basic unit, and almost $1500 for a loaded system, the Magic Link costs more.

The Magic Link is bulkier than the Newton, but I like it better. It is more centrally based on communications and boasts an underlying technology called Telescript. When you get a Magic Link you are automatically signed up in an AT&T service called PersonalLink. (It costs only $10 a month, something of a bargain.) By communicating with the service, you can send a message to someone on any electronic service or even by fax. And Telescript allows "intelligent" messages. Among other things, that means you can send mail to people under certain conditions, or use software agents to seek out replies to queries. (For more on Telescript, see my column about General Magic, August 1993.)

The Magic Link interface, called Magic Cap, is busier than Newton's—it relies much more on icons, and it provides an unprecedented degree of whimsy. For instance, on the main screen, which depicts a virtual office, I have installed an animation of several dolphins diving into my desk. While not functional, it is endearing. Magic Cap has caught some flak from folks who charge that it is too game-like (although compared with Microsoft's Bob interface for home users, it's more formal than a spreadsheet), but that very quality makes the Sony device quite easy to use.

But the best part of the Magic Link is what it doesn't try to do: read your handwriting. Instead, you input text with a little on-screen typewriter-style keyboard. (Or you can connect an optional full-size keyboard, which rather defeats the purpose of a palmtop device.) Two-finger typing is surprisingly accurate, though I still make about one mistake every line or so. But while making an error on the Newton almost always requires me to scratch out the entry and start over, at least I can fix my Magic Link input with the delete key—much easier.

For a while I carried around my Sony every day, kept my calendar on it, sent messages to people with it. Then I used it more rarely. Why? For one thing, it is difficult to coordinate its information with the data on my desktop machine. For some reason, a Macintosh version of the Magic Cap interface has yet to appear. Keeping two calendars and two phone books is a messy situation. And when I go on trips, I feel like a jerk when I wind up packing both my PowerBook and my Magic Link. It's as if someone has pinned a sign on me: "Early Adopter and Slave to Technology."

Link Me

All of this would be forgivable if the Magic Link were really linked. But it isn't. You have to plug it into a phone line, using the Link's crummy 2400-bps modem. What you really need is a wireless version. That's what we want from PDAs—the ability to receive messages from anywhere and send back replies, right? I am convinced that personal digital assistants will forever and continually break my heart until they are all completely wireless.

So imagine my delight in January, when the Motorola company introduced not only a General Magic device called Envoy but also a Newton device called Marco—both hooked up for wireless communications using a combination of the Ardis wireless system and the Radio-Mail communications system.

> *Machines should adjust themselves to my behavior and not the other way around*

I haven't had time yet to play with loaner versions of the Envoy or the Marco. But at the recent Macworld Expo, I did have a chance to handle them. Both are somewhat bulkier than the nonwireless alternatives—wireless modems and multiple batteries make these worthy of the name *palmtop* only if you are talking about trees instead of hands. Both cost more than their wired counterparts. Still, they are sufficiently compact to stuff in a briefcase.

I took advantage of the opportunity to send myself some electronic mail. With the Envoy, I sent myself a list of the costs of various RadioMail subscription plans. The message arrived safely at my Internet provider, and I figured that to satisfy my (admittedly heavy) needs in handling mail, the device would cost me hundreds of dollars a month, landing me just this side of the poorhouse.

With the Marco, I input the following note: "This is a Marco message." When I got home, the Newtonesque translation was waiting for me: This i5 a marco missile.

Broke my heart. ▥

The Buying Game

A true tale of technolust and commerce

OVER A 90-DAY PERIOD LAST autumn, I bought three new Macintosh systems: one for home, one for my office, and one for a friend. No particular meaning should be read into my experiences, because a single case isn't necessarily representative of the treatment a given vendor gives all its customers. Your experiences may vary wildly. Nevertheless, the mistakes I made and the lessons I learned may help you with future purchases.

Retail Fun

Sometimes you want a new computer instantly. To wait is unthinkable. This was not my state of mind when we went out shopping, but my husband had the glazed look of a true believer. I bet he'd have given a stranger every dime in our bank account for a Quadra 630. So I stepped in to negotiate.

After searching ads in our local *Computer Currents*, we went to an Apple-specific dealer in San Francisco, ComputerWare, to check its inventory and prices. The store had most of what we wanted. Moreover, we found the company willing when asked to match prices advertised by competitors. We had to show documentation, in the form of an ad, and there was no mixing and matching—we couldn't get the lowest price on a computer from one competitor and the lowest price on a printer from another competitor. Thanks to ComputerWare's unwritten policy, we didn't have to drive out of town to get a good price on the Macintosh itself.

Still, there were problems. For example, only three monitors were on display at the store, none of which was the one we wanted, so we couldn't compare it with others. Also, ComputerWare didn't have the brackets needed to install an internal CD-ROM drive. This was in September. In October we bought an external drive. In late November ComputerWare finally received brackets from Apple, which says it underestimated demand. No kidding.

Another problem was that ComputerWare mistakenly canceled our order for the Apple Video/TV System board when we canceled our order for an internal CD-ROM drive. Neither was available on the day we bought the computer. As a result, weeks dragged by needlessly without the dazzling benefit of football or game shows to enliven our Macintosh use.

Still, I liked ComputerWare, which has won plaudits from a local consumer publication for value and service. With luck, the computer chains of the world won't put all independents like ComputerWare out of business.

Discount Hell

Retailers sometimes moan that customers don't care whether the stores stay in business or not—all they care about is price, price, price. It's true; when I was buying a Power Macintosh 7100 for my business,

I wanted the least expensive system on the planet available from an authorized dealer. And available now. So I hauled myself down the San Francisco Peninsula to Palo Alto, and to Fry's, a Silicon Valley legend.

Fry's is a small chain of stores that's made to order for employees of the high-tech industry. Its merchandise ranges from cola and candy to trashy paperbacks to DIP switches to complete computer systems and aisles and aisles of software, all aligned neatly within a

warehouse decorated in a Western motif.

On the phone, a saleswoman at this technological-assault-on-the-senses gave me the lowest total price for the 6100 and Apple Personal LaserWriter 320 I wanted. So the trek seemed worthwhile, though when I got there I couldn't find a salesperson who knew anything about monitor emissions.

A salesman I did find got impatient when asked to open a box to show me a display. Then there was an interminable wait to pay and then pick up the system while indifferent or beleaguered staff looked on. (Luckily, Fry's sells magazines, so I was able to distract myself from leaping over the will-call desk to throttle the so-called help.)

Maybe it was a day from hell for the store as well—a staffer claimed many employees had quit the evening before. I have no idea if that's true; I do know that I wouldn't go back to Fry's to buy anything that might require service, because simply buying the computer was such a chore. For a toaster or junk food Fry's might be just the ticket, but I'll pass on it for future hardware purchases.

Mail-Order Maybe

A friend who lives abroad asked for my help in buying a Mac. So, armed with her simple request for a Performa 475 with 8MB of RAM and a StyleWriter II, I called around and compared price quotes from several places. Out-of-state mail order was attractive because out-of-state operations don't usually charge sales tax. (Note that many states are becoming aggressive about sales tax, though. Even if the reseller doesn't collect sales tax, the state can go directly to the consumer for it.)

J&R ComputerWorld in New York had the lowest prices I found in my brief survey and is an authorized Apple dealer. So I called back to place my order—and *continues*

requested an additional discount. "It's the end of the month," I whined, hoping the salesman had a quota to meet, "and my friend really needs to save money. Since she's buying both a computer and printer, is there anything else you can do for her?" Surprisingly, the salesman said yes and lopped off another $40.

The salesman at J&R was fast and friendly, but the system arrived late. Another friend used J&R to order a Performa as a Christmas present, but it didn't arrive. He called J&R and discovered that the promised Mac wouldn't be available until *January*, despite what he had been told when ordering. So my friend canceled the order and went elsewhere.

At the time I placed my friend's order, Performas were available by mail only through Apple dealers who also had retail storefront businesses (see *Conspicuous Consumer*, November 1994, for a list). Consumers now have more options, since Apple has given "limited pilot approval" for selling Performas to the top three Mac mail-order catalogers—MacWarehouse, MacConnection, and The Mac Zone—as well as Mac's Place and Tiger, which have been selling PowerBooks and Apple peripherals for some time.

Lessons Learned

By now a scarred veteran of the buying game, I've learned some tips that may make your shopping sprees easier.

- Know what you want and, if you can, buy everything you need at one time. ClarisWorks, for example, was priced at $70 as part of a system but cost as much as $129 alone when I made my purchase. Peripherals and software often have different profit margins than computers; buying them together gives you greater leverage in negotiating for a discount.
- Comparison shop by fax. Two weeks went by before all the dealers I surveyed responded to my fax, but it was great to get price quotes in black and white. Interestingly, one store faxed me twice—with different prices. When I inquired, I was told the lower estimate was a "corporate discount." Ask loudly for a corporate or business discount should one apply to your purchase.
- Do your homework. There may be special promotions available—or the hardware you want may be nearing the end of its life span. For example, the NEC MultiSync 5FGe monitor I bought is no longer manufactured. Model turnover is very fast in this industry; prices are at their peak when a model is brand-new and tend to drop sharply toward the end of the cycle. Ditto for Mac systems, of course, and other equipment. Had I thought to call NEC before shopping, I could have

negotiated a better price or waited for inventory-clearance sales.

- Ask dealers to match prices. The best price I found on a US Robotics Mac & Fax Sportster 14.4 modem was $158. But the mail-order company offering that price had a significant shipping fee and an iffy track record. So I called MacWarehouse and asked a saleswoman if she could match that price. It was only a $3 difference, but I also saved on shipping and got my package the next day. (MacWarehouse cautions that it is not company policy to match competitors' prices.)
- Be flexible. Home versions of Apple's business machines are often a bargain. I bought a Power Macintosh 6100 because I needed a computer immediately. As it happens, it would have been less expensive to wait for a Performa version of the Power Mac—assuming I found a 14-inch display acceptable.

The Store I Hate

Occasionally I stop at a nearby Comp-USA to browse, but I wouldn't buy anything there. Why not? Well, one day I went to check out a monitor. While there, I noticed there was no copy of FileMaker Pro in the limited space devoted to Macintosh software. I asked a clerk nicely if he could find it for me. He assured me that if I couldn't find it neither could he. When I expressed surprise that Comp-USA didn't carry FileMaker, one of the best-selling applications for the Mac, the clerk checked it for me on the store computer. At least he tried, but the computer listed only the Windows versions of File-Maker, not the Mac version, and so he couldn't give me any information. What else? This store was selling version 1.0 of Arrange from Common Knowledge. Version 2.0 had been out since August, and by this time it was November. Duh.

Now, it's unfair to suggest that the Mac-hostile atmosphere, lukewarm response, and pathetic selection I experienced at a single store are necessarily representative of the chain as a whole. Please check out the situation for Mac owners at your local store and come to your own conclusion. And in the meantime, happy hunting—there's a Mac bargain just waiting for you. **m**

Editors' Choice

THE BEST PRODUCTS FEATURED IN MACWORLD

Edited by Elizabeth Maffly

Macworld Editors' Choice is a complete listing of the hardware and software products selected as the best of their type in *Macworld's* comparative articles. A ❖ next to a product indicates that we chose more than one product in that category. A ◗ next to a product listing indicates that a native Power Mac version is available.

Hardware

MONITORS

SMALL COLOR MONITORS, Jan 94
14-inch display: ❖ Sony CPD 1430; Sony Corp. of America, 800/222-7669; $779.95.
❖ Nanao FlexScan F340i•W; Nanao USA, 800/800-5202; $799.
15-inch display: NEC MultiSync 4FGe; NEC Technologies, 708/860-9500; estimated street price $755.

TWO-PAGE COLOR MONITORS, Nov 94
PressView 21 Display System; SuperMac Technology, 408/541-6100; $3999.

NETWORK HARDWARE

REMOTE-ACCESS SERVERS, Oct 94
Mixed networks: NetConnect Remote Access Server; Asanté Technologies, 408/435-8401; $3899 for eight ports.
AppleTalk networks: ARA Multiport Server; Apple Computer, 408/996-1010; four ports $1799, eight ports $3298.

PRESENTATION HARDWARE

PORTABLE PRESENTERS, Jan 95
Z115; nView, 804/873-1354; $5495.

PRINTERS

COLOR PRINTERS, Aug 94
Low-end ink-jet: DeskWriter 560C; Hewlett-Packard, 800/752-0900; $719.
Solid ink-jet: Phaser 300i; Tektronix, 503/682-7377; $9995.
Thermal-wax transfer and color laser: Phaser 220i; Tektronix, 503/682-7377; $5995.

DYE-SUBLIMATION PRINTERS, Jul 94
Prepress proofing—tabloid size/fastest: Phaser 480; Tektronix, 503/682-7377; $14,995.

Prepress proofing—tabloid size/most complete: Rainbow; 3M, 612/733-1110; estimated street price of $20,000.
Prepress proofing—letter size: ProofPositive Full Page; SuperMac Technology, 408/541-6100; $7999.
General publishing and business: Phaser IISDX; Tektronix, 503/682-7377; $9995.

PERSONAL PRINTERS, Sep 94
Ink-Jet: DeskWriter 520; Hewlett-Packard, 800/752-0900; $365.
Laser—$1000 to $1600: microLaser Pro 600; Texas Instruments, 214/995-6611; $1599.

WORKGROUP PRINTERS, Feb 94
High-speed: Hewlett-Packard 4Si MX; Hewlett-Packard, 800/752-0900; $5499.
Best buy: ❖ Apple LaserWriter Pro 630; Apple Computer, 408/996-1010; $2529. ❖ Hewlett-Packard LaserJet 4M; Hewlett-Packard, 800/752-0900; $2329.

SCANNERS/IMAGE CAPTURE

ELECTRONIC CAMERAS, Sep 94
Apple QuickTake 100; Apple Computer, 408/996-1010; $749. ◗

HIGH-BIT FLATBED COLOR SCANNERS, Mar 95
❖ Arcus II; Agfa, 508/658-5600; $3495.
❖ PowerLook; Umax, 510/651-8883; $3495.

LOW-COST COLOR SCANNERS, Nov 93
$1300 to $1600: ❖ La Cie Silverscanner II; La Cie, 503/520-9000; $1599.
❖ Hewlett-Packard ScanJet IIc; Hewlett-Packard, 800/752-0900; $1599.
Under $1300: Mirror 800 Plus Color Scanner; Mirror Technologies, 612/633-4550; $1299.

OCR, Nov 93
OmniPage Professional; Caere Corp., 408/395-7000; $995. ◗

SYSTEMS/STORAGE

1.3GB OPTICAL STORAGE, Dec 94
Best low-cost solution: 1.3Gig MO; Club Mac, 714/768-8130; $2099.
Best overall performance: Genesis 1300; Microtech, 203/468-6223; $2899.

HIGH-SPEED HARD DRIVES, Aug 93
2.7GB drives: ❖ Nova XL 2700; Microtech, 203/468-6223; $2999. ❖ Vista 3.5GB; Relax, 510/471-6112; $3499.

SCSI-2 adapter: QuickSCSI; PLI, 800/288-8754; $499.

PC COPROCESSING, Oct 94
OrangePC Model 210; Orange Micro, 714/779-2772; $1283.

RAID STORAGE SYSTEMS, Apr 95
RAID 3 or 5: MR/5 RAID; MegaDrive Systems, 310/247-0006; $18,840.
RAID 0: SledgeHammer 2000FMF; FWB, 415/474-8055; $2359.

SYSTEM UPGRADES, Feb 95
Upgrade for Macintosh Quadra 650, 800, or 950: Power Macintosh Upgrade Card; Apple Computer, 408/996-1010; $699.
Upgrade for other 680X0 Macs: Replace with Power Macintosh 6100/60 with CPU booster and cache card. Power Macintosh 6100/60; Apple Computer, 408/996-1010; $1819 (base system with 8MB of RAM). PowerClip (CPU booster); Newer Technology, 316/685-4904; $245. 256K cache card; various companies, roughly $200.

VIDEO/DISPLAY

24-BIT VIDEO CARDS, Apr 94
Inexpensive acceleration: PrecisionColorPro 24XP; Radius, 408/434-1010; $599.
Full-featured acceleration: Thunder II GX•1360; SuperMac Technology, 408/541-6100; $4499.

HIGH-END VIDEO EDITING, Jun 94
Presentation video: ❖ MoviePak2 Pro Suite; Raster-Ops, 801/785-5750; $4199. ❖ VideoVision Studio; Radius, 408/434-1010; $4499.
Corporate video (offline): Media Composer 400s; Avid Technology, 508/640-6789; $14,995.
Corporate video (online): VideoCube; ImMix, 916/272-9800; $40,500.

PHOTOSHOP ACCELERATORS, Apr 94
PhotoBooster; Radius, 408/434-1010; $999.

Software

ACCOUNTING/FINANCE

GROWING A SMALL BUSINESS, Nov 93
Small-business system: M.Y.O.B.; Best Ware, 201/586-2200; $199.
Home office/personal finance: MacMoney; Survivor Software, 310/410-9527; $119.95.
continues

MACWORLD Editors' Choice

BUSINESS TOOLS

PORTABLE-DOCUMENT SOFTWARE, Apr 95
Document Distribution: Common Ground 1.1; No Hands Software, 415/802-5800; $189.95.

STATISTICS, Oct 93
Exploratory data analysis: DataDesk 4.1; Data Description, 607/257-1000; $595. ◄
Comprehensive package: SYSTAT 5.2.1; SYSTAT, 708/864-5670; $895.

CD-ROM

TOP 10 CD-ROMS, Mar 94
Overall: Seven Days in August; Time Warner Interactive Group, 818/955-9999; $79.99.

COMMUNICATIONS/NETWORKS

COMMUNICATIONS SOFTWARE, Aug 94
Basic connectivity: ZTerm; David P. Alverson (no phone number available); $30.
Terminal emulation: Crosstalk for Macintosh; Digital Communications Associates, 404/442-4000; $195.
Internet exploration: VersaTerm; Synergy Software, 215/779-0522; $125.

DOS WINDOWS EMULATION, Oct 94
Timbuktu Pro 1.0.3 for Macintosh, Timbuktu 1.1 for Windows; Farallon Computing, 510/814-5000; $199 each. ◄

HIGH-SPEED FAX MODEM SOFTWARE, Oct 93
Faxstf; Telefocus; 816/886-9800; $79.

NETWARE CONNECTIVITY, Sep 93
NetWare for Macintosh; Novell, 801/429-7000; $495 for 5-user license to $2295 for 200-user license.

PROTOCOL ANALYZERS, Jul 94
EtherPeek, AG Group, 510/937-7900; $795.

TERMINAL EMULATOR, Oct 93
VersaTerm; Synergy Software, 215/779-0522; $149.

GRAPHICS

3-D MODELING, Dec 94
Stand-alone modeler: formZ; autodessys, 614/488-9777; $1495. ◄
Integrated-modeling package: Strata StudioPro; Strata, 801/628-5218; $1495. ◄
Entry-level modeler: Infini-D; Specular International, 413/253-3100; $695. ◄

CLIP ART'S GREATEST HITS, Jan 94
Overall collection: ❖ ClickArt Studio Series; T/Maker Company, 415/962-0195; $99.95 per volume.
❖ Electronic Clipper subscription service; Dynamic Graphics, 800/255-8800; $67.50 per month.
❖ Metro ImageBase Electronic Clip Art; Metro ImageBase, 800/525-1552; $74.95 per volume, CD-ROM

$149.95. ❖ Images with Impact series; 3G Graphics, 800/456-0234; $99.95 to $129.95 per volume, CD-ROM $499.
❖ Typographers' Ornaments; Underground Grammarian, 609/589-6477; $25 per volume; ten TIFF albums $200; EPS volumes $50 each.

DRAW PROGRAMS (LOW-COST), Sep 93
Budget draw: Expert Draw; Expert Software, 305/567-9990; $49.95.
Budget draw/paint: UltraPaint; Deneba Software, 305/596-5644; $79.
Beginners' program: Aldus SuperPaint; Aldus Consumer Division, 619/558-6000; $149.95.
Overall: Canvas; Deneba Software, 305/596-5644; $399. ◄

FONT BUYERS' GUIDE, Mar 94
Text-face collection: Type On Call CD-ROM; Adobe Systems, 415/961-4400; $99 (this price includes the ability to unlock two families from preselected packages); an additional $25 enables you to unlock individual faces, or $69 to $179 for unlocking families.
Display/decorative-face collection: Fontek; Letraset, 201/845-6100; $39.95 per face.
Bargain collection: Monotype ValuePack; Monotype, 312/855-1440; $89 for 57 fonts.

IMAGE DATABASES, Oct 93
❖ Aldus Fetch 1.0; Adobe Systems, 206/628-5739; $295.
❖ Multi-Ad Search 2.0; Multi-Ad Services, 309/692-1530; $249.

IMAGE EDITORS, Feb 95
Adobe Photoshop 3.0; Adobe, 415/961-4400; $895. ◄

INTEGRATED SOFTWARE

INTEGRATED SOFTWARE, Feb 94
ClarisWorks; Claris Corporation, 408/727-8227; $299. ◄

ONLINE SERVICES

ONLINE SERVICES, Aug 94
E-mail: America Online; America Online, 703/893-6288; basic monthly fee $9.95.
Reference: CompuServe; CompuServe Information Service, 614/457-0802; basic monthly fee $8.95.

ORGANIZATION/PRODUCTIVITY

CALENDARS, Jul 93
Alarm system: ❖ First Things First; Visionary Software, 503/246-6200; $79.95. ❖ Smart Alarms Plus; JAM Software, 203/630-0055; $75.

All-around scheduler: Now Up-to-Date; Now Software, 503/274-2800; $99.
Meeting scheduler: Meeting Maker; On Technology, 617/374-1400; five-pack $495.

GRAPHING SOFTWARE, Aug 94
DeltaGraph Pro 3 3.0.4; DeltaPoint, 408/648-4000; $195. ◄

SALES-AUTOMATION SOFTWARE, Oct 93
❖ Contact Ease; WestWare, 619/274-5053; one user $395, five users $1495.
❖ CBS; Colleague Business Software, 512/345-9964; $495.

TEXT-RETRIEVAL SOFTWARE, Dec 93
Small system: On Location; On Technology, 617/374-1400; $129.
Multiuser system: Personal Librarian; Personal Library Software, 301/990-1155; $995.

PRESENTATION TOOLS

PRESENTATION SOFTWARE, Jul 94
Persuasion 3.0; Adobe Systems, 206/622-5500; $495. ◄

UTILITIES

BRAVE NEW DOCUMENTS, Jan 94
Application-independent document distribution: Common Ground; No Hands Software, 800/598-3821; $189.95.
Book-length documents: FrameReader; Frame Technology, 800/843-7263; $84.95.

PRINTING, Sep 93
PC-printer cable packages: PowerPrint; GDT Softworks, 604/291-9121; $149.

VIRUS KILLERS, Jul 94
Commercial software: Virex; Datawatch, 919/549-0711; $99.95. ◄
Free software: Disinfectant; free from various online services.

VIRTUAL MEMORY SOFTWARE

VIRTUAL MEMORY, Jun 94
Virtual memory software: Virtual 3.0; Connectix Corp., 415/571-5100; $99.
Memory-boosting software: RAM Doubler 1.0.1; Connectix Corp., 415/571-5100; $99. ◄

WORD PROCESSORS

HIGH-END WORD PROCESSOR (for fast 68040 Macs and Power Macs), Mar 95
Microsoft Word 6.0; Microsoft Corporation, 206/882-8080; $325. ◄

LOW-COST WORD PROCESSOR, Mar 95
MacWrite Pro; Claris Corporation, 408/727-8227; $99. ◄ m

Star Ratings

HARDWARE AND SOFTWARE REVIEWS AT A GLANCE

Edited by Wendy Sharp

Macworld Star Ratings lets you compare Macintosh products by providing summaries of *Macworld*'s authoritative product reviews from the past year. The number of stars indicates quality; our reviewers assign five stars to outstanding products and one star to poor ones. The ● symbol indicates that a product is available in a native Power Mac version.

If a product has been upgraded since our last review, the most recent version number supplied by the vendor appears in parentheses after the reviewed version number. To read a full review of any product in the listing, please consult the issue listed at the end of each synopsis.

Vendors: Please write to *Macworld Star Ratings*, 501 Second St., San Francisco, CA 94107 to inform us of changes in the version number or list price of your product, or of changes to your phone number.

Software

BUSINESS TOOLS

★★★ **4D First 1.0 (1.0.1), ACI US, 408/252-4444, $295.** This entry-level relational database is a low-cost way to distribute the power of 4D and 4D Server to an office full of Macs. It's not much easier to use, however, than the full-fledged 4D. **May 94** ●

★★★ **AccuZip6 1.8.7, Software Publishers, 800/233-0555, $689.** Bulk-mail software has informative progress indicators, batch and individual processing, low rates, and flexible parsing during import, but the interface is incomprehensible. **Sep 94**

★★ **Adobe Acrobat 2.0, Adobe Systems, 415/961-4400, $195.** The font fidelity of this portable-document software is uneven, and the software demands too much in resources compared with other options. **Mar 95**

★★★ **Adobe Acrobat for Workgroups 2.0, Adobe Systems, 415/961-4400, $1595.** As a collaboration tool, this software is relatively inexpensive and offers well-done annotation tools. However, it's resource-intensive, and creating hypertext documents with it isn't easy. **Mar 95**

★★ **BaseMap 1.0.1, GeoPoint, 415/957-1560, $149.** For simple maps displaying simple data, this map-making tool may be useful. It's not for the cartographic sophisticate, however, as it offers very limited data-display abilities and only one projection. **May 94**

★★ **Bulk Mailer CASS 1.00d, Satori Software, 206/443-0765, $150.** Unattended operation is possible with this bulk-mail software, but batch processing is slow and the program has coding problems. **Sep 94**

★★★ **CA-Cricket Graph III 1.52, Computer Associates International, 516/342-5224, $129.** Graphing software's features are just right for charts in the physical and social sciences, but lack pizzazz. The program is easy to learn and use, and includes math features for data transformations and curve fitting. **Dec 94**

★★★★ **ClarisImpact 1.0 (1.0 v3), Claris Corp., 408/727-8227, $399.** Business graphing, project management, object-oriented drawing, word processing, and presentation functions merge in this business graphics software. The outstanding integration offers versatility that dedicated programs are pressed to match. **Jun 94** ●

★★★★ **ClarisWorks 3.0, Claris Corp., 408/727-8227, $129.** Inexpensive, easy to use, and surprisingly powerful integrated software is hands down the best package available. It's far better in terms of features, speed, integration, and use of system resources than its competition. **Feb 95** ●

★★★ **Cricket Graph III 1.5 (1.52), Computer Associates International, 516/342-6000, $129.** Basic and foolproof charting program produces clean charts, although its feature set is fairly modest. **Apr 94**

★★★★ **Crystal Ball 3.0, Decisioneering, 303/449-5177, $295.** Compact business-simulation software is fast enough for complex projects and can pay for itself in disaster-avoidance in a variety of business tasks. **Oct 94**

★★★★ **Decision Analysis 2.5, TreeAge, 800/254-1911, $379.** Decision-assistance software handles complex business cases by constructing tree diagrams of probabilities and payoffs. It offers a type of modeling that is realistic and easy to modify. **Nov 94**

★★★★ **DeltaGraph Pro 3 (3.5), DeltaPoint, 408/648-4000, $195.** This charting program is the best feature-for-feature value in Macintosh charting. **Apr 94** ●

★★★ **Extend+BPR 3.0, Imagine That, 408/365-0305, $990.** Business-modeling software includes superior templates for business-process reengineering, but some programming experience is helpful. **Oct 94**

★★★ **FastTrack Schedule 2.1, AEC Software, 703/450-1980, $279.** Simple project-management software is ideal for managers who need to put together a schedule quickly and easily, but if you require more power to manage conflicts, you'll need a more comprehensive program. **Sep 94**

★★★★ **Helix Express 2.0.1 (2.0.4), Helix Technologies, 708/465-0242, $589.** Icon-based relational-database software's improved performance makes it a serious competitor for all-Mac networks. Especially notable is its much faster speed; multiuser operation is downright snappy. **Jul 94**

★★★ **InfoDepot 2.0, Chena Software, 610/770-1210, $295.** All-in-one program for project planning includes tools for brainstorming and organizing ideas; scheduling project steps; and entering, calculating, and presenting data. It does a good job but has some flaws. **Jan 95**

★★★ **Map II 1.5, ThinkSpace, 519/858-5047, $395.** Well-structured program has most of the functions a simple geographical information system needs and is suitable for introductory instruction in GIS and for alert first-time users who just like maps. **May 94**

★★★★ **MarcoPolo 3.0, Mainstay, 805/484-9400, $895.** Full-featured document-management system is significantly improved. The addition of OCR—both the handling of unrecognized words and the ability to batch-process TIFF files with OCR—make it a very usable system. **Jan 95**

★★★ **MicMac 2.0v1, Nirvana Research, 408/459-9663, $89.** The concept of Mac as dictation machine is undeniably attractive, and Nirvana Research has pulled it off well. It takes lots of hard drive space to save recordings, though. **Nov 94**

★★★★ **Microsoft Excel 5.0, Microsoft Corp., 206/882-8080, $339.** Although the feature set of this spreadsheet is stunningly rich, the resource requirements are jaw-dropping, including nearly 30MB of hard drive space plus, to run comfortably, 24MB of RAM. Still, it is relentlessly complete. **Jan 95** ●

★★★★ **Microsoft FoxPro for Macintosh 2.5 (2.6), Microsoft Corp., 206/882-8080, $495.** Dazzlingly fast relational database has a greatly improved interface. For projects of 4 to 20 users that handle large amounts of data it offers excellent performance. **Apr 94**

★★★ **Microsoft Works 4.0, Microsoft Corp., 206/882-8080, $99.95.** Although this isn't the best integrated package around, it's a sensible, low-cost choice. It offers a respectable word processor, database, spreadsheet, calendar, and address book, as well as a slide-show module, and drawing and communications tools. **Jan 95**

★★★★ **Pablo 2.0.1 (2.03), Andyne Computing, 613/548-4355, $695.** This effective end-user data-reporting tools puts a considerable workload on the corporate information department, but it sidesteps the hassles of SQL data access and produces great reports with minimal effort. **Jul 94**

★★★ **Street Atlas USA 2.0, DeLorme Mapping, 207/865-1234, $169.** For the most part, this geographical information software delivers what it promises at a great price. Although inaccuracies in the data are troubling, DeLorme pledges to fix all reported errors in subsequent annual updates. **Oct 94**

★★★ **TeamFlow 3.1, CFM, 617/275-5258, $295.** Total Quality Management flowchart software is a valuable business tool. Its report printing and customizability are limited, however. **Nov 94**

★★★★ **TopDown 4.0 (4.1), Kaetron Software Corp., 713/298-1500, $345.** Flowcharting program's support for custom symbols and automatic drawing aids, along with its ability to let you easily create and navigate lower-level charts, make it a productive tool. **Jul 94**
continues

Star Ratings

★★★★ **ZipZapp 1.0, True Basic, 603/298-8517, $39.95.** You can use this data-reference utility to find an area code, the correct spelling of a city's name, and more. The interface is intuitive, and the cost, low. **Oct 94**

★★★ **ZP4 12.1 (14), Semaphore Corp., 408/688-9200, $125.** Inexpensive bulk-mail software supports batch and individual processing, but the progress indicators are uninformative, and unattended operation requires extra work. **Sep 94**

COMMUNICATIONS/NETWORKS

★★ **AccessPC 3.0, Insignia Solutions, 415/694-7600, $129.95.** Utility translates most word-processor and some database formats, but some of its translations result in data loss. **Apr 94**

★ **BLAST Professional, BLAST Inc., 919/542-3007, $139.** Our reviewer could not get this telecom software to work reliably and consistently, and found the minimalist and quirky interface frustrating. **Jan 95**

★★★ **Crosstalk for Macintosh 2.0 (2.0.1), Digital Communications Associates, 404/442-4095, $195.** Commendable communications product has a feature set that well matches its competition. Still, the script editing is complex. **Apr 94**

★★★★ **DOS Mounter Plus 4.0, Dayna Communications, 801/269-7200, $100.** File-transfer and translation utility works with floppies, removable drives, and network volumes. **Apr 94**

★★ **The Internet Companion, The Voyager Company, 914/591-5500, $29.95.** Well-written, HyperCard-based electronic book offers less information than others. Internet access is available through accompanying software, but it's a terminal-emulation screen. **Dec 94**

★★★★ **Internet Explorer Kit and Internet Starter Kit, Hayden Books, 317/581-3500, $29.95 each.** Well-written books and useful software combine to produce one of the best introductions to the Internet available for Mac users. **Dec 94**

★★★★ **Internet Membership Kit, Ventana Media, 919/942-0220, $69.95.** If you need access to the Internet, this book and software combination is a good package. The best part about it is its included preconfigured software. **Dec 94**

★★★★ **MacLink Plus/Translators Pro 7.5, DataViz, 203/268-0030, $149.** If your PC files are in archaic formats, you'll need this file-transfer and translation utility. It's a great option for most users. **Apr 94**

★★★ **MicroPhone Pro 2.0, Software Ventures Corp., 510/644-3232, $295.** The new feature set of this communications package includes multiple sessions, faxing, TCP/IP networking, and more, but it's a mixed bag. Not all the features are well integrated, although some are innovations for which users will be grateful. **Oct 94**

★ **PowerShare Collaboration Servers, Apple Computer, 408/996-1010, $999.** Before this collaboration software will be ready for prime time, Apple needs to overhaul the Admin application, add serious diagnostic aids and provide comprehensive documentation. **Aug 94**

★★★ **QuickMail 3.0, CE Software, 515/221-1801, $199 to $3799.** If you're shopping for a first-time E-mail application, this product is a good choice for ease of use and setup. The most promising new tool, rules-based messaging, lacks some important features. **Jan 95**

★★★ **RunShare, Run, Inc., 408/353-8423, $199 to $2499.** System extension endeavors to pump up file-transfer speeds across both local- and wide-area networks. It offers twofold to threefold throughput gains for fast Macs and large files but is less useful with small files or slow Macs. **Feb 95**

★★★ **SITcomm 1.0 (1.0.1), Aladdin Systems, 408/761-6200, $120.** Inexpensive telecommunications software is fairly easy to set up and use, and will do well for people who use just one or two online services. **Apr 94**

★★★ **Snap Mail 1.0.1, Casady & Greene, 408/484-9228, $200 to $1440.** Software will put you on the E-mail trail more cheaply than any competing product, if you can live with some minor shortcomings. **Jun 94**

★★ **SoftWindows 1.0, Insignia Solutions, 415/694-7600, $499.** You can run Windows software on a PowerMac with this emulation software, but although it's a viable solution, you pay the price in terms of performance, compatibility, and actual cost. **Aug 94** ◖

★★★★ **Timbuktu Pro 1.0 (1.05), Farallon Computing, 510/814-5000, $199 to $1999.** Terminal emulation product is a must-have for people who need direct connection to computer systems on a variety of networks. **May 94** ◖

★★ **TrafficWatch II 2.0 (2.1), Neon Software, 510/283-9771, $495.** The price of this AppleTalk traffic monitor is closer to that of full-blown network analyzers that do much more. Without printing, alarms, or true multiprotocol support, this product misses the mark. **Jun 94**

★★★★ **White Knight 12.0, The FreeSoft Company, 412/846-2700, $139.** While this telecom software can be bewildering, it works impressively well. If you're willing to read the manual, the program may become your favorite telecom tool. **Nov 94** ◖

DESKTOP PUBLISHING

★★ **CheckPost 1.3, Working Software, 408/423-5696, $249.95.** Interface aside, this imagesetter-simulation software is generally disappointing. It can't automatically scale pages, it prints on a single sheet, and its error reporting is limited. **Nov 94**

★★★ **ClickBook 1.1, BookMaker Corp., 415/354-8161, $69.95.** If you need to create inexpensive booklets quickly and without hassle, this print utility that helps you format documents in double-sided booklet form is an excellent tool. **Nov 94**

★★★ **Download Mechanic 1.0.2, Acquired Knowledge, 619/587-4668, $249.** The strengths of this PostScript downloader lie in its tools for dealing with problem files, but when dealing with large files, it performs slowly and occasionally crashes. **Feb 95**

★★★★ **FontChameleon 1.0.1 (1.5), Ares Software Corp., 415/578-9090, $295.** Font utility introduces a new font-creation technology; it builds serif and sans serif fonts from a master outline file. It offers high-quality renditions of popular fonts, plus the ability to customize fonts. **Sep 94**

★★★ **FontMixer 1.0, Monotype Typography, 312/855-1440, $79.** Although a tad expensive for a one-trick pony, this font utility is a straightforward, relatively painless way to mix characters from different fonts to create composite fonts. **Oct 94**

★★★★ **Fontographer 4.0.4 (4.1), Altsys Corp., 214/680-2060, $495.** No other font editor does more than this one. For the price of a few font families, it can give you a universe of unique faces. **Oct 94** ◖

★★ **FotoTune 1.1 (1.13), Agfa Division of Miles, 508/658-5600, $395.** Color-management software has a capable engine, but it's not a complete color management system. Invisible tech support and poor documentation were only part of the problem. **Apr 94**

★★★★ **LaserCheck 1.0, Systems of Merritt, 205/660-1240, $199.** Imagesetter-simulation software can save you hundreds of dollars, and many hours, on imagesetting jobs by letting you use a laser printer to proof your work. **Nov 94**

★★★★ **Let'er RIP 2.0, Lupin Software, 916/756-7267, $239.** The flexibility, clean implementation, and attention to detail of this PostScript downloader make it a pleasure to use. **Feb 95**

★★★★ **PageTools 1.0, Extensis Corp., 503/274-2020, $129.** Collection of ten PageMaker Additions is packed with utility. Many users will find the PageAlign, PagePrinter, and PageRulers Additions alone worth the price, and the others frosting on the cake. **Dec 94**

★★★★ **Print Shop Deluxe 1.0 (1.1), Brøderbund Software, 415/382-4400, $49.95.** Even the most ham-fingered can create professional-looking greeting cards, signs, banners, stationery, and calendars with these desktop publishing templates and graphics. While it's not a substitute for a high-end program, it is easy to use and inexpensive. **Apr 94** ◖

★★★ **ReadySetGo 6.0.2, Manhattan Graphics Corp., 914/725-2048, $395.** There's no strong reason not to use this destop publishing software if its tools meet your needs, but there's no compelling reason to choose it, either. Its low price is nice, but not enough. **Oct 94**

EDUCATION/ENTERTAINMENT

★★★★★ **A.D.A.M. The Inside Story, A.D.A.M. Software, 404/980-0888, $79.95.** Multimedia anatomy CD-ROM teaches basic anatomy and physiology with a tantalizing mix of sound, graphics, and animation. If you are the least bit interested in learning more about how the human body works, buy this program. **Mar 95**

★★★ **Aquazone 1.0, Inago, 416/487-4005, $79.95.** The fish in this aquarium simulation are beautiful, but they're darned hard to keep alive. Only two varieties of fish are included. **Jan 95**

★★★ **Creative Writer 1.0, Microsoft Corp., 206/882-8080, $64.95.** Graphics/page-layout/word-processor hybrid offers some terrific type effects, zany sounds, and bright graphics. While it doesn't teach kids to be better writers, it does encourage them to develop ideas and provides a fun vehicle to express those ideas creatively. **Sep 94**

★★★★ **Crossword Wizard 1.0, Cogix Corp., 415/454-7217, $49.95.** If you're a crossword fan, this crossword-puzzle generator is a must. Although it's not perfect, the play mechanics are fantastic. **Dec 94**

★★★ **The Cruncher, Davidson & Associates, 310/793-0600, $59.95.** If you want to teach a child spreadsheet basics, this combination educational spreadsheet and business application will do the job. It's creative and easy to use, but slow. **Aug 94**

★★★★ **Crystal Crazy, Casady & Greene, 408/484-9228, $49.95.** Ultraglossy, superpolished version of the classic Crystal Quest is challenging and fun without being overly difficult. Each level retains some old elements, and adds some new ones to keep you on your toes. **Jun 94**

★★★ **Firefall Arcade 1.0 (1.0.2), Inline Software, 617/935-1515, $49.95.** If you loved the classic video game Centipede, or are just looking for a fun shoot-'em-up, this arcade-style game will satisfy. **Jun 94** ◖

★★★★ **Grolier Multimedia Encyclopedia, Grolier Electronic Publishing, 203/797-3530, $395.** CD-ROM encyclopedia has excellent search capabilities, weighs much less than a shelf of books, and is lots of fun. Its timeliness and some hierarchical snafus were slight problems. **Jul 94**

★★★ **Kids World, Bit Jugglers, 415/968-3908, $30.** Although the painting tools could be more robust,

this screen-saver–creation tool for kids is easy to use, cleverly designed, and can keep kids busy for hours. **Mar 95**

★★★★ **SimCity 2000, Maxis Software, 510/254-9700, $54.95.** Your goal with this marvelous city-simulation is to build a city and run it successfully. The game is fascinatingly complex but it's simple to use. **Jun 94**

★★★ **Small Blue Planet 1.2.1, Now What Software, 415/885-3432, $79.95.** Nicely integrated collection of beautiful Earth-from-space images on CD-ROM lacks many features of standard atlases and doesn't have a search function, but is endlessly fascinating. **Jul 94**

★★★★ **Spin Doctor (1.0), Callisto Corp., 508/655-0707, $59.95.** In the tradition of the best Macintosh games, this game tests your wits and reflexes alike. It's part strategy game, part kinetic sculpture. **Jun 94**

★★★★ **WarPlanes 1.0, Maris Software, 800/336-0185, $69.** Wonderful multimedia CD-ROM tours the post-WWII era in military aviation. As well as pictures and text, it includes rotatable models of aircraft, an extensive database, campaign maps, historical narration, live combat audio, and three flight simulators. **Mar 95**

FINANCE/ACCOUNTING

★★★★ **Andrew Tobias' TaxCut 1993, MECA Software, 203/255-1441, $79.95.** The free-form approach and flexible Help menus of this tax-preparation software make filling out your tax return a smooth, almost relaxing process. **Apr 94**

★★★ **ExpensePlus 1.0.1 (1.0.2), State of the Art, 714/753-1222, $139.95.** Software uses a Newton MessagePad to record expenses, then sends the data to a Mac to create and print expense reports. **Apr 94**

★★ **Financial Competence 1.5, Competence Software, 603/435-5098, $99.** Business economics tutorial explains how financial statements are compiled and how they relate to each other. **Jul 94**

★★★★ **MacInTax 1993, Intuit, 602/295-3110, $69.95.** Tax-preparation software provides a reliable, structured interface for building your tax return. **Apr 94**

★★★ **MacInTax Tax Planner, Intuit, 602/295-3110, $29.95.** Construct a five-year forecast of your tax liability, projecting tax figures through 1997 in a concise summary format. **Apr 94**

★★★ **MacInTax Tax Savings Guide, Intuit, 602/295-3110, $19.95.** Collection of tax tips and suggestions is designed to help you better understand your tax return and reduce your tax liability. **Apr 94**

★★★ **MacMoney 4.01, Survivor Software, 310/410-9527, $89.95.** Personal-finance software has new and improved features that will please longtime users, but it hasn't kept up with the leaders in the field and won't win many new converts. **Jul 94**

★★★ **Managing Your Money 6.0, MECA Software, 203/255-1441, $79.95.** Personal-finance program does a good if somewhat roundabout job of keeping track of your total financial picture. Although it isn't as easy to use as the competition, it excels in tax, investment, and financial planning. **Jun 94**

★★★★ **Quicken 5.0, Intuit, 415/322-0573, $49.95.** The addition of a calendar and new ease-of-use features keep this personal-finance software comfortably ahead of the pack. This upgrade is an incremental, but welcome, improvement to an already excellent product. **Feb 95**

★★★ **StreetSmart 1.0, Charles Schwab & Company, 800/334-4455, $59.** If Schwab is where you want your investments held, and if you want to have tighter control over your portfolio and save on brokerage

fees, you should seriously consider this financial investment software. **Feb 95**

GRAPHICS

★★★★ **Adobe Illustrator 5.5, Adobe Systems, 415/961-4400, $595.** Despite slight speed disappointments, this draw program's upgrade is a bargain. It includes more than 200 tile patterns, 220 fonts, and the Acrobat Distiller and Exchange utilities. **Sep 94** ◖

★★★★ **Adobe Photoshop 3.0, Adobe Systems, 415/961-4400, $895.** Image-editing program both broadens its capabilities and simplifies its work environment in this dynamic upgrade. While not perfect, the pros far outweigh the cons. **Jan 95** ◖

★★ **Art Explorer 1.0, Aldus Consumer Division, 619/558-6000, $49.95.** While its cartoon style is refreshing, this paint/draw program for kids 8 to 12 years old is still rough around the edges. Its biggest limitation is that it's unusably slow on 68030 Macs. **Feb 95**

★★★★ **Blueprint 5.0, Graphsoft, 410/290-5114, $295.** For plain old 2-D drafting, this CAD software has a rich, easy-to-use feature set and is admirably fast. The Power Mac version in particular is a first choice for large architectural or engineering diagrams. **Jan 95** ◖

★★★ **ClarisDraw 1.0, Claris Corp., 408/727-8277, $399.** For presentations without grand artistic pretensions, this draw program can be an effective tool. However, $400 may be too much to pay. **Jan 95**

★★★ **Dabbler 1.0, Fractal Design Corp., 408/688-5300, $99.** Art-education and paint software provides an excellent paint set with an appealing if slightly quirky interface, at a great price. **Nov 94**

★★★★ **DeBabelizer Lite 1.0 (1.1), Equilibrium Technologies, 415/332-4343, $129.** Terrific graphics utility converts graphics files from one format to another. It offers a choice selection of capabilities at a nice, slim price. **Aug 94**

★★★ **DesignWorkshop 1.0 (1.1), Artifice, 503/345-7421, $895.** The accessible interface and versatile modeling environment of this 3-D modeling software may be worth the fairly high price, particularly for architectural-design conceptualization. **May 94** ◖

★★★★ **ElectricImage Animation System 2.0, Electric Image, 818/577-1627, $7495.** Although the price seems high, this software, with its extraordinary animation and image-rendering capabilities, is worth every penny for cinematic-production professionals. **Dec 94**

★★★ **Flying Colors, Davidson & Associates, 310/793-0600, $40.** While not the most dynamic kids' program, this paint/draw program provides easy-to-use tools and nicely drawn stamps for ages eight to adult. **Feb 95**

★★★★ **IntelliDraw 2.0, Adobe Systems, 619/558-6000, $129.** Wonderful general-purpose graphics package works well, does a great job of automating drawing tasks, and is straightforward. Despite its breadth of features, it always feels approachable. **Sep 94**

★★★★★ **Kai's Power Tools 2.0a (2.1), HSC Software, 310/392-8441, $199.** Phenomenally powerful suite of Photoshop plug-ins have an addictive quality typically associated with arcade games. **May 94** ◖

★★★ **Koyn Fractal Studio 2.02 (2.1), Koyn Software, 314/878-9125, $119.95.** Software lets you generate beautiful fractals of your own design. It's a reasonable choice if you are interested in Sierpinski triangles or naturalistic forms, but it's not an all-fractals-for-all-people program. **Aug 94** ◖

★★★★ **KPT Bryce 1.0, HSC Software, 805/566-6200, $199.** For less than $200, you get a remark-

able 3-D landscape-rendering program, a CD-ROM full of images, a slide-show utility, and even some screen-saver modules. Although the innovative, graphics-heavy interface can be confusing, this software is lots of fun. **Dec 94**

★★★ **Live Picture 1.5.5, HSC Software, 805/566-6200, $3995.** Promising image editor is rather rudely assembled atop some marvelous technology and burdened by an extremely high price tag. Though fast and blessed with all the benefits of a proxy-based system, its day-to-day functions leave room for improvement. **Dec 94**

★★★★ **LogoMotion 1.0, Specular International, 413/253-3100, $149.** Easy-to-use 3-D package is eminently affordable. It's a terrific program, both for creating flying logos and as an entry-level 3-D package for nonprofessionals. **Nov 94** ◖

★★★★ **MacDraft 4.0, Innovative Data Design, 510/680-6818, $449.** Report-links to Excel and a clean interface make this 2-D CAD software an excellent choice for use in mechanical engineering and construction. Plus, it's easy to learn. **Mar 95**

★★★★ **MacroModel, Macromedia, 415/252-2000, $1495.** This 3-D modeling software is a solid resource to have along when you venture out into 3-D space. The interface is elegantly simple. **May 94** ◖

★★★★ **MetaFlo', The VALIS Group, 415/435-5404, $595.** Graphics utility yields interesting visual effects with a minimum of fuss. It imparts elasticity to 2-D images, letting you push and pull collections of pixels while retaining the visual integrity of the image. **Aug 94** ◖

★★★★ **MiniCad 5, Graphsoft, 410/290-5114, $795.** Excellent CAD software offers major performance for its price. It's admirably easy to learn. **Nov 94** ◖

★★★★ **Paint Alchemy 1.0, Xaos Tools, 415/487-7000, $99.** These plug-in graphics effects are a tremendous value that both casual users and professional artists can use to design a little chaos into their work. **May 94**

★★★ **PhotoMatic 1.01, DayStar Digital, 404/967-2077, $199.** AppleScript-based utility lets you automate tasks in Adobe Photoshop 2.5.1 or later. Although it's limited, it can relieve you of mundane chores. **Nov 94**

★★★★ **Pixar Typestry 2.1, Pixar, 510/236-4000, $299.** With QuickDraw GX support, an approachable interface, a strong array of animation features, and outstanding image quality, this 3-D type-effects software is worth a try. It adds a new dimension to the way you look at type. **Feb 95** ◖

★★★★ **PixelPaint Pro 3.01, Pixel Resources, 404/449-4947, $379.** Color paint program strikes a good balance between the artistic demands of color painting and the technical precision of image processing. **Mar 95**

★★★ **Pointillist, Pictor GraFX, 310/865-0495, $39.95.** Stereogram software creates images that look like random dots, but a 3-D image emerges from the pattern and appears to hover in front of the background. **Jul 94**

★★★ **Ray Dream Designer 3.1.1, Ray Dream, 415/960-0768, $349.** 3-D graphics program provides competent (if sometimes awkward) modeling tools, offers excellent surface-texturing capabilities, and produces high-quality ray-traced renderings. **Mar 95** ◖

★★★ **ScanPrepPro 1.2, ImageXpress, 404/564-9924, $695.** Adobe Photoshop add-on automates the scanning and image-massaging process and produces good results, although it's somewhat unstable. **Nov 94**

★★★★ **Scenery Animator 1.0.4 (1.1), Natural Graphics, 916/624-1436, $149.** Landscape rendering and animation software uses U.S. Geographical Survey data to create remarkably realistic 3-D representations of terrain. Its flaws are few, and our reviewer *continues*

Star Ratings

recommends it. **Aug 94** ◀

★★★★ **Showplace 2.0 (2.1), Pixar, 510/236-4000, $495.** Adequate, entry-level, 3-D modeler is suitable for illustration and other graphic arts applications. This version offers improved access to MacRenderMan, one of the best renderers around, plus plug-in modeling tools. **Apr 94**

★★★ **Specular Collage 2.0.1, Specular International, 413/253-3100, $399.** Practical image-compositing solution supplies a smooth interface and strong support for Adobe Photoshop 3.0. As long as you're willing to return to Photoshop to confirm your edits and make final changes, it's a serviceable tool. **Feb 95**

★★★ **Terrazzo 1.0, Xaos Tools, 415/487-7000, $199.** Turning a random group of pixels into a geometric pattern may not be everyone's passion, but this plug-in graphic-effects module has appeal for a select niche of fabric, graphic, and video designers. **Nov 94**

★★★★ **TextureScape 1.5, Specular International, 413/253-3100, $195.** Algorithmic art program lets you manipulate and arrange PostScript shapes to create seamlessly repeating patterns. Like the best tools, it's simple enough to be fun and flexible enough to give you meaningful control. **Feb 95** ◀

★★★ **Typestry 2.0 (2.1), Pixar, 510/236-4000, $299.** An approachable interface, animation support, and outstanding Renderman rendering technology make this 3-D type-renderer a popular choice. **Jun 94** ◀

★★★★ **TypeTwister 1.0, Adobe Systems, 415/961-4400, $29.95.** Inexpensive, easy-to-use, and fun type styler lets you create wildly styled text effects, although it won't satisfy hard-core type manipulators. **Jan 95**

★★★ **Vistapro 3.0, Virtual Reality Laboratories, 805/545-8515, $149.95.** 3-D landscape rendering software uses digital versions of U. S. Geological Survey maps to create images and allows you to add external features such as buildings and rivers. Although it's a good program, it has some limitations. **Feb 95** ◀

MATH/SCIENCE

★★★★ **Caduceus Science Review Macintosh Project 1.0 (1.1), Scientia, 617/776-3427, $250.** If you're taking the MCAT, you'd be nuts not to buy this interactive science review. With proper use, its 9MB of files are certain to improve your score. **Apr 94**

★★★★ **Chamber Works 1.0.2 (1.1), OnScreen Science, 617/776-6416, $99.** Simulator for particle-physics events is the best introduction to particle physics yet produced, at a great price. **Dec 94**

★★★★ **JMP 3.0, SAS Institute, 919/677-8000, $695.** New features of this statistics software include floating tool palettes, an annotation tool for data tables, and an experimental-design module. **Sep 94**

★★★ **Kekulé 1.1, PSI International, 410/821-5980, $495.** Science software reads scanned chemical-structure drawings and interprets them, giving both a diagram for checking interpretation accuracy and a formal string representation of the structure. **Nov 94**

★★★★ **LabView for Mac 3.0.1, National Instruments, 512/338-9119, $1995.** For large-scale, demanding projects in data acquisition and analysis, this scientific software is an unchallenged standard. **Jul 94**

★★★ **Maple V 3.0, Waterloo Maple Software, 519/747-2373, $795.** If you prefer to do your own programming and function creation, you'll benefit from this symbolic mathematics software's efficient use of your Mac's resources. This version hits most of the points on your symbolic-math wish list. **Oct 94**

★★★★ **MATLAB 4.1, The Math Works, 508/653-1415, $1695.** Relatively expensive numerical math software has added nearly 100 new graphics commands, improved its treatment of sparse matrices, and added commands for sound processing. **Nov 94**

★★★★ **Resampling Stats 1.0, Resampling Stats, Inc., 703/522-2713, $225.** Innovative statistics software has proved itself to be a superior teaching tool in numerous classroom tests. If you have any interest in statistics, you should give this admirably straightforward approach careful consideration. **Jun 94**

★★★★ **SerePlot 2.12, Scientfic Visions, 301/593-0317, $135.** If you have piles of data and don't need animated, exploding bar-charts in 24-bit color, this scriptable plotting software should be part of your analysis tool kit. **Jun 94**

★★★★ **Spyglass Plot 1.0, Spyglass, 217/355-6000, $295.** This scientific-charting software is the first choice for serious large-set plot crunching. **Oct 94**

★★★★ **Statistica/Mac 4.1, StatSoft, 918/583-4149, $695.** At present, this statistical software is the undisputed features-per-dollar champion in the Mac market. **Mar 95**

★★★★ **SuperScope II 1.25, GW Instruments, 617/625-4096, $1490.** Despite a relatively small instrument library, this laboratory data-acquisition software effectively covers a wide range of needs, and learning to use it won't become your life's work. **Oct 94**

★★★★ **Survival Tools 1.0, Abacus Concepts, 510/540-1949, $295.** The combination of survival analysis with the StatView template systems gives you a virtual actuary-in-a-box. It's a great set of tools, conveniently packaged. **Feb 95**

ORGANIZATION/PRODUCTIVITY

★★★ **ACT 2.0, Symantec Corp., 503/334-6054, $249.95.** Contact manager's file-level compatibility with DOS and Windows and its complete contact management make it worth considering if you can live with its weak scheduling functions. **Mar 95**

★★★★ **Arrange 2.0, Common Knowledge, 415/325-9900, $349.** If your needs fall beyond the usual calendar and address-book functions, this personal information manager is a strong contender. It now has more calendar functions and print options. **Dec 94** ◀

★★★ **Claris Organizer, Claris Corp., 408/727-8227, $99.** New personal information-manager users, lured by the low price, good performance, and ease of use of this product, will find that it meets their needs. Most longtime PIM users won't be tempted to switch. **Jan 95**

★★★★ **DateBook & TouchBase Pro Bundle 4.0, Adobe Systems, 619/558-6000, $89.99.** Personal information manager package is now easier to use and offers many new features. The excellent linking between contacts and calendar is the most significant feature. **Sep 94**

★★★ **DateView 1.0.1 (1.0.2), Advanced Software, 515/225-4163, $99.95.** If you're willing to sacrifice some features to get simplicity and speed, this calendar/to-do manager makes sense. It integrates with the contact manager, InTouch. **Aug 94**

★★★ **Dynodex for Macintosh 3.5, Portfolio Software, 802/434-6400, $69.95.** Excellent contact manager has a few new features, improved performance, and an easier-to-use interface. **Sep 94**

★★★ **FastPace Instant Contact 1.0, Foresight Technology, 817/731-4444, $79.99.** Although this contact manager could use a few additional features—es-pecially a menu-bar search function—it does a capable job, and it is intuitive and easy to use. **Jan 95**

★★★ **First Things First Proactive 1.1, Visionary Software, 503/246-6200, $149.** Capable scheduling program has some convenient features. It's worth a look if you don't have to share information with a contact manager. **Nov 94**

★★★ **Full Contact 2.01 (2.02), FIT Software, 408/562-5990, $169.** Personal information manager can handle with speed and style tasks that would choke other products, but frequently, using it feels like a full-time job. **Aug 94** ◀

★★★★ **In Control 3.0.4, Attain Corp., 617/776-1110, $85.** Excellent to-do-list manager and outliner, coupled with a good calendar is a strong choice if you live and die by to-do lists. **Oct 94**

★★ **Souvenir 2.2, ComposeTel, 415/327-0744, $49.** While this contact manager is fast and simple, it's hard to recommend it when you can buy integrated contact managers and schedulers for the same price. **Dec 94**

★★★ **TimeSquare 1.0, Team Building Technologies, 514/278-3010, $149.** Fast, flexible, network calendar program has lots of handy features, but it's missing a few as well, such as multiday events and label grouping. **Aug 94**

PRESENTATION TOOLS

★★★★ **Adobe Premiere 4.0, Adobe Systems, 415/961-4400, $795.** Video-editing software for the Power Mac remains solid and reliable and has new and improved professional-level features. With the right hardware, it can give desktop-video editors broadcast-quality products with a minimum of compromises. **Dec 94** ◀

★★★ **Amazing Animation, Claris Corp., 408/727-8277, $59.** Cute pictures, funny sounds, and a kid-friendly interface come together in this package that lets children produce short animations or interactive presentations. The canned animations and scenes grow tiresome, however. **Jan 95**

★★ **Animation Master 2.0.5, Hash Enterprises, 206/750-0042, $699.** Although this animation software packs extraordinary power at a reasonable price, it's difficult to learn and prone to instability. **Oct 94** ◀

★★★ **Deck II 2.1, OSC, 415/252-0460, $399.** AV Macs turn into digital-audio workstations with this software that enables you to record, mix, modify, and play back CD-quality sound. It doesn't include equalization features. **Jun 94**

★★★★ **FlipBook 1.0, S. H. Pierce, 617/338-2222, $89.** Animation printing utility lets users make flip-books out of QuickTime movies, PICS animations, and Scrapbook files. **Jun 94**

★★★ **HyperCard 2.2, Apple Computer, 408/996-1010, $249.** Authoring tool strikes a good balance between power and ease of use, and its price is reasonable. It may not satisfy all your wishes, but it should keep you happily building stacks. **Sep 94**

★★★★ **Macromedia Director 4.0, Macromedia, 415/252-2000, $1195.** Although this multimedia program remains far from easy to use, this admirable upgrade increases the program's power and improves its interface. Multimedia professionals will continue to find it the best package available. **Sep 94**

★★★ **Microsoft PowerPoint 4.0, Microsoft Corp., 206/882-8080, $399.** If you're in the market for a presentation-graphics program, this is a good choice to use along with Word or Excel, as long as you don't mind the lack of animation functions. For general purposes, though,

other alternatives have the edge. **Feb 95**

★★★★ **Morph 2.0 (2.5), Gryphon Software,** 619/454-6836, $239. Easy to use morphing software is beautifully designed, with delightful new features, including the ability to morph QuickTime movies. Using it is as painless as morphing gets. **Apr 94** ◐

★★ **MovieWorks 2.0.2, Interactive Solutions,** 415/377-0136, $295. With diligence you can get decent results with this all-in-one QuickTime-based multimedia package. But other entry-level programs make leaping into multimedia easier and more rewarding. **Sep 94**

★★★ **The Multimedia Workshop 1.0, Davidson & Associates,** 310/793-0600, $79.95. Children or adults can use this media-integration tool without big investments of either time or money. It's full of compromises, though. **Nov 94**

★★★ **Passport Producer Pro 1.0 (1.1.2), Passport Designs,** 415/726-0280, $995. Superb, albeit quite expensive, media-integration package makes assembling even complex presentations surprisingly easy. Path animation is limited to entrances and exits. **Apr 94**

★★★★ **Persuasion 3.0, Adobe Systems,** 206/622-5500, $339. Users have plenty of new features to cheer about, including improved tool palettes, extensive charting options, and hypertext functions with this presentation graphics program's upgrade. High memory and disk-space requirements are drawbacks. **Sep 94** ◐

★★★ **SoundEdit 16, Macromedia,** 415/252-2000, $379. Digital audio software supports 16-bit sound and has enough goodies to earn it a place in a multimedia producer's toolbox. But its lack of record-level controls limits its usefulness as a professional audio tool. **Dec 94**

★★★★ **SuperCard 1.7.1, Allegiant Technologies,** 619/587-0500, $495. Multimedia authoring system adds a few welcome enhancements, including QuickTime support, and squashes some old bugs. For current users, the upgrade is well worth the price; for others, it's an excellent alternative to more expensive authoring systems. **Feb 95**

PROGRAMMING

★★★★ **IDL 3.5, Research Systems,** 303/786-9900, $1500. If you're an image processing professional, you should consider adding this shockingly powerful, compact, graphics-oriented, interpreted language to your tool kit. **Oct 94**

★★★★ **Object Master for Think C and C++,** ACI US, 408/252-4444, $255. Object-oriented development environment is full of goodies and will pay for itself due to increased programmer productivity. **Apr 94** ◐

★★ **ScriptWizard 1.0, Full Moon Software,** 408/253-7199, $99. Software attempts to make writing and debugging AppleScript scripts easier but doesn't offer enough improvement over Apple's Script Editor. **Jan 95**

★★★ **VIP BASIC 1.0.1 (1.0.3), Mainstay,** 805/484-9400, $295. Programming language lets programmers who know only BASIC get started producing real, if interpreted, Mac programs. It's a serious developer's tool, though it's not on the same footing as VIP-C. **Jun 94** ◐

★★★★ **VIP-C 1.0.1 (1.5.1), Mainstay,** 805/484-9400, $495. If you've mastered the rudiments of C, this programming-code generator will let you code about ten times faster than you could using only an editor. Its real strength is in rapidly assembling smaller projects. **May 94** ◐

★★★★ **VIP-C 1.5, Mainstay,** 805/484-9400, $495. For convenience in producing 680X0/Power Macintosh applications, this programming utility is a fine investment. Intermediate to advanced users will get the most

benefit, but even beginners will find that it helps turn student projects into serious apps. **Feb 95** ◐

UTILITIES

★★ **Apple Personal Diagnostics 1.0 (1.1), Apple Computer,** 408/996-1010, $129. In trying to make a hardware tool for the rest of us, Apple has come up short. This hardware-diagnostics utility has an uneven manual, some less than thorough tests, and a surprisingly unsatisfying interface. **Nov 94** ◐

★★★ **AppleSearch 1.0, Apple Computer,** 408/996-1010, $1799. Although it has some rough edges, this product for archiving and retrieving text is highly useful. It presents retrieved information clearly and extracts text from documents in many formats. **May 94**

★★★ **Atticus Vista 1.0 (1.0.2), Atticus Software Corp.,** 203/348-6100, $69.95. Control panel and application automatically catalog the disks you mount on the desktop. It has a few problems, but it can help bring order to disorganized disk collections. **May 94**

★★★★ **Automap Road Atlas for Macintosh 2.01 (2.04), Automap,** 206/455-3552, $99.95. Mapping software tells you how to get where you're going better than any other map or software our reviewer has seen. Although screen redraw is slow, it's worth it for the written directions and maps. **Jul 94**

★★★★ **Cal 1.0, Thought I Could,** 212/673-9724, $79.95. Well-chosen set of desktop necessities includes an excellent calculator, an associated-formula editor, a datebook, and a calendar. Due to its easy access and ample power, this software has become an everyday tool for our reviewer. **Jan 95**

★★★ **CD AllCache 2.0, CharisMac Engineering,** 916/885-4420, $79.95. CD-ROM accelerator improves access time by caching a CD's directory and putting its most frequently used data into RAM. Despite this software's limitations, most CD addicts will find the speed improvement worth the trouble. **Sep 94**

★★★★ **CD-ROM ToolKit 1.0.5 (1.1), FWB,** 415/474-8055, $79. Software accelerator can halve the time it takes to open files and search on a CD-ROM. **May 94** ◐

★★★★★ **Conflict Catcher II 2.1.1, Casady & Greene,** 408/484-9228, $79.95. Customizable, fast, and safe extension-management utility goes well beyond the basics. For Power Macintosh users, it even tells which extensions aren't written in native code and are likely to slow down Power Macs. **Oct 94** ◐

★★★ **DiskDoubler 4.0, Symantec Corp.,** 503/334-6054, $79.95. In pure efficiency terms, this file-compression software is a winner, but it lacks many features of previous versions, including passwords on self-extracting files and automatic recompression. **Aug 94**

★★★★ **DiskGuard 1.0.1 and DiskGuard Remote, ASD Software,** 909/624-2594, $129 to $799. Rock-solid, flexible disk-protection tools are worth serious consideration if your Mac or Macs are accessible to others. The remote version (in five- and ten-user packs) adds network features, including a clock-synchronization function. **Mar 95**

★★★★ **DiskTop 4.5 (4.5.1), PrairieSoft,** 515/225-3720, $99.95. Organizing a crammed hard drive is a more manageable task with this simple but powerful file-management utility that lets you copy, move, rename, delete, and find files—without using the Finder. **Jul 94**

★★★★ **Drive7 3.0, Casa Blanca Works,** 415/461-2227, $79.95. Highly recommended hard drive-formatting utility easily formats and partitions most drives

and provides all the options you need. And within its limitations, its Mount Cache utility provides a real performance boost. **Nov 94**

★★★ **eDisk 2.0, Alysis Software Corp.,** 415/928-2895, $149.95. Driver-level software compresses data read to your drive on the fly and automatically expands data read from your drive. It offers transparent compression. **Dec 94**

★★★★ **Icon Mania 1.0 (1.01), Dubl-Click Software,** 503/317-0355, $69.95. Delightful icon-editing utility comes with terrific tools for building new icons, including an outstanding thumbnail feature that builds custom icons from graphics files. **Aug 94**

★★★★ **Kaboom 3.0, Nova Development Corp.,** 818/591-9600, $49.95. Sound-effects utility with sound-editing application is a fun program for anyone who wants to play with sound. **Feb 95**

★★★★ **Launch Pad 1.0, Berkeley Systems,** 510/540-5535, $49.99. If you want to share your Mac with your kids, this desktop utility is a worthwhile investment. It can even speak menu items and file names out loud for kids too young to read. **Jan 95**

★★★★ **Maxima 3.0, Connectix,** 415/571-5100, $99. If you have more than 8MB of RAM, you can use some of it as a RAM disk, speeding up disk-based operations, with this inexpensive utility. **Nov 94**

★★★★ **Norton DiskDoublerPro 1.1, Symantec Corp.,** 503/334-6054, $109. Utility collection includes DiskDoubler, AutoDoubler, and CopyDoubler. Because of its ease of use, the product is a good choice for beginners. **Feb 95** ◐

★★★ **Norton Utilities for Macintosh 3.1, Symantec Corp.,** 503/334-6054, $149.95. Data-protection and -recovery utility collection is leaner, meaner, and faster than ever before, but it's also surprisingly uneven. While Disk Doctor leads the pack for disk-repair utilities, the back-up module is weak and the new UnErase module is missing some features. **Feb 95**

★★★★ **Now Utilities 5.0, Now Software,** 503/274-2800, $89. Three of the modules of this fine-tuned, interlocking utility set—Now FolderMenus, Now Menus, and Now SuperBoomerang—are almost indispensable, and the other six are well worth considering. **Jan 95** ◐

★★★ **Open Sesame 1.02 (1.1), Charles River Analytics,** 617/491-3474, $99. Utility automates Finder operations without macros or scripts. People with strict work habits are more likely to find its suggestions worthwhile than are those who don't follow a routine. **May 94** ◐

★★★ **Peirce Print Tools 1.0, Peirce Software,** 408/244-6554, $129. Nine handy printing utilities work with QuickDraw GX. Most of the modules are useful, but not all are must-haves. **Jan 95**

★★★ **PopupFolder 1.0 (1.5), Inline Software,** 617/935-1515, $59.95. Finder utility is handy and easy to use, but sometimes sluggish. **Aug 94**

★★★★ **PowerAgent 1.1, SouthBeach Software Corp.,** 305/858-8416, $159. You can revolutionize your Macintosh work with this agent program that manages scripts. It provides excellent support for FileMaker Pro. **Nov 94**

★★★★ **PowerMerge 2.0, Leader Technologies,** 714/757-1787, $129. Powerful file-management tool helps you keep individual files, folders, or entire volumes organized and up-to-date. This version lets you compare and launch documents, rename files, trash superfluous files, and lots more. **Aug 94**

★★★ **ProFiles 1.0, Dayna Communications,** *continues*

Star Ratings

801/269-7200, $129. Unusual new utility lets you group related files and folders for quick access and actions such as making aliases, copying, turning sharing on and off, and more. The recommended RAM allocation of 1MB may be a problem for computers with limited memory. Aug 94

★★★★ RAM Doubler 1.0.1 (1.5), Connectix Corp., 415/571-5100, $99. Inexpensive system extension doubles available RAM for many Mac users. There are a number of requirements, however, including System 7, 4MB of physical RAM, and a 68030 board. May 94 ◯

★★ SCSI Director Pro 3.0.6, Transoft Corp., 805/565-5200, $99. Utility provides simple, one-button hard disk formatting, but when it comes to doing some of the fancy tricks, the going gets rough and technical support costs $1.90 per minute. Sep 94

★★★★ Square One 2.0, Binary Software, 310/449-1481, $74. The slick design, flexibility, and straightforward interface of this file-launching utility make it a pleasure to use. Dec 94

★★★ Stop & Go 4.0, Engram International, 415/455-1100, $69.99. File-protection/relaunch utility uses a portion of your hard disk to save a snapshot of the data in your Mac's RAM. It's fast, and it relaunches files, applications, and extensions in a single, unified process, but it's unduly complicated. Oct 94

★★★ UnderWare 1.0.1, Bit Jugglers, 415/968-3908, $59.95. Inspired, silly fun for your Mac's desktop comes from a control panel that adds three features: a screen saver, desktop patterns, and animations that run on your desktop while you work. Jun 94

★★★★ Virex 5.0 (5.03), Datawatch Corp., 919/549-0711, $99.95. The extremely fast, trouble-free performance of this software makes the task of guarding against computer viruses almost painless. May 94

★★★★ VirtualDisk 1.1a (2.0), Continuum Software, 206/695-8136, $79. Rapid disk cataloging; fast, efficient label-printing; and an excellent disk-copy utility make this software a wonderful value. Jul 94

★★★ Wiz Tools for PowerBook 1.2.2, ASD Software, 909/624-2594, $79.95. The connectivity, file-synchronizing, and security features of this collection of PowerBook utilities are appealing, but the rest of the modules are also-rans. Jan 95

VERTICAL MARKETS

★★★ Autoscore 1.0, Wildcat Canyon Software, 510/527-5155, $150. Converting the human voice into MIDI note information is a challenging task. If you have the right music software, the right mike, and the right voice, this music-recognition software can actually pull it off. Feb 95

★★★ Bird Brain 2.01, Ideaform, 515/472-7256, $125. Database lets bird watchers record every sighting of every bird they have ever seen to create electronic life lists. Although it can be slow, it includes species names and other information. Jan 95

★★★★ Claire, The Personal Music Coach 1.0.1, Opcode Systems, 415/856-3333, $129.95. Musicianship program teaches pitch and interval recognition, sight singing, and intonation. Although the interface is nonstandard, it's easy to learn. May 94

★★★ DigiTrax 1.1, Alaska Software, 408/738-3320, $349. If you're an amateur musician or a multimedia producer with modest sound-recording needs and you have a Quadra AV, consider this audio-recording software. What it lacks in features, it makes up for in simplicity and a relatively low price tag. Mar 95

★★★ ErgoKnowledge 1.0, Visionary Software, 503/246-6200, $395. Despite a few shortcomings, this CD-ROM offers a good, basic review of office-computer ergonomics. Dec 94

★★★ MayaCalc 2.3.1, Ecological Linguistics, 202/546-5862, $120. 4th Dimension database alleviates much of the pain involved in working with the complex, multilayered Maya calendar. Feb 95

★★★★ Maya Hieroglyphic Fonts, Ecological Linguistics, 202/546-5862, $10 to $60 per set. Although these fonts based on Mesoamerican hieroglyphic scripts are beautifully rendered, the character spacing is sometimes uneven. Feb 95

★★★★ Mayo Clinic Family Health Book 1.2, IVI Publishing, 612/686-0779, $69.95. Medical CD-ROM for home use deals with the full gamut of health-care topics, from AIDS to zygotes, although it doesn't include any reference to alternative therapies. Sep 94

★★★ Mayo Clinic: The Total Heart 1.0, IVI Publishing, 612/686-0779, $59.95. Cardiovascular health and related subjects are the topics of this medical CD-ROM for home use. Although it makes liberal use of drawings, photographs, and animations, video sequences would have been more effective. Sep 94

★★★ Medical HouseCall 1.0, Applied Medical Informatics, 801/464-6200, $99.95. Interactive medical guide is a painless way for people to learn about diseases, tests, and therapies. Although it's easy to use and interesting, some of the medical images were incorrectly labeled. Feb 95

★★★ MusicTime 2.0, Passport Designs, 415/726-0280, $149 to $249. Music-notation program is geared for hobbyists and students. If your needs aren't complex, it may fit the bill, at a great price. Oct 94

★★★ Performer 5.02, Mark of the Unicorn, 617/576-2760, $495. A colorful, redesigned interface and improved sheet-music view are part of this MIDI recording program's most worthwhile overhaul in years. If you like the sheet-music view, this is the product to buy. Mar 95

★★★★ Practica Musica 3.0, Ars Nova Software, 206/889-0927, $140. Music-teaching program, with emphasis on sight-reading and ear-training techniques, shines as a smart, infinitely patient personal music coach in the classroom. Jan 95

★★★ SAM-CD, Scientific American Medicine, 212/754-0550, $395. Despite a few shortcomings, this medical reference work—a popular series of publications covering topics in clinical medicine—should prove a worthwhile addition to any medical library. Sep 94

★★★ Vision 2.08, Opcode Systems, 415/856-3333, $495. MIDI program's list of exclusive, creativity-slanted features, such as endless count off, scrubbing (which lets you hear the music as you drag across it), and subsequences, give the program a usability edge. Mar 95

★★★★ WillMaker 5.0, Nolo Press, 510/549-1976, $69.95. Legal software quickly and easily automates the creation of wills, health-care directives and proxies, and final-arrangements documents. It offers excellent supporting explanations and background. Jun 94

WRITING TOOLS

★★★★ Bookends Pro 3.1, Westing Software, 415/435-9343, $129. Comprehensive database program catalogs and stores all of your reference material—actual quotes as well as citations. It's a useful tool that researchers will appreciate. Mar 95

★★★ Grammatik 6 for Macintosh, WordPerfect Corp., 801/225-5000, $49.95. The low price, pleasant interface, and improved accuracy of this grammar checker make it worthwhile for a large number of quality-driven writers. It still misses some errors. Feb 95

★★★★ MacWrite Pro 1.5 (1.5 v2), Claris Corp., 408/727-8227, $249. The clean, uncluttered interface of this word processor is still one of its assets. This upgrade adds support for AppleScript and more. May 94 ◯

★★★ Microsoft Word 6.0, Microsoft Corp., 206/882-8080, $329. If you can put this word processor's new features—including cross-referencing, AutoText, automatic numbering, macros and more—to work and you have a Quadra 650 or faster Mac, take the plunge. If you have a slower 68040 Mac, think twice; and if you have a 68030 Mac, don't even think about it. Feb 95

★★★ Nisus Writer 4.0, Nisus Software, 619/481-1477, $495. In a few specialized areas—such as mixing English and non-Romance languages, this word processing program is unmatched. However, for some high-end uses, such as table creation and editing, it's a poor choice. Mar 95

★★★★ OmniPage Professional 5.0, Caere Corp., 408/395-7000, $695. In a historic first for OCR, this Power Macintosh software has an accuracy of 100 percent on good text samples. It does still make occasional baffling minor errors on real-world documents. Nov 94 ◯

★ The Oxford English Dictionary, Oxford University Press, Electronic Publishing, 212/679-7300 ext.7370, $895. CD-ROM dictionary contains half a million words, but the flaws, omissions, and unreliability are unbearable. Apr 94

★★★ Random House Unabridged Dictionary, Random House Electronic Publishing, 212/572-2600, $179. Dictionary on CD-ROM works within any program and is good at guessing misspelled words. Although some functions don't work reliably, the quality and design of the software are good. May 94

★★★ TextBridge 2.0, Xerox Imaging Systems, 508/977-2000, $99. Optical character recognition software is impressive on good documents and can be trained and automated. You won't find that anywhere else at this price. Sep 94 ◯

★★★★ WriteNow 4.0.1, WordStar International, 617/494-1200, $119.95. Tidy word processor's conservative use of memory (the application fits into a dainty 600K partition) and graceful interface will continue to win it fans. Jun 94

★★★ Writing Coach 1.0, WritePlace Software, 503/484-6380, $89. If you'd like help with your writing, this writing-skills tutorial could be a great investment. Skillfully worded worksheets assist with planning, organizing, and revising. Dec 94

Hardware

INPUT DEVICES

★★★ DrawingSlate, CalComp Digitizer Division, 714/821-2000, $395. Digitizing tablet is a good, compact, low-cost implementation of pressure sensitivity, although the battery-operated stylus is a bit heavy. Jun 94

★★★ Ear Phone Streamline AV, Jabra Corp., 619/622-0764, $169. As a hands-free telephony tool—and as a replacement for the Apple PlainTalk microphone—this telephone/speech-recognition earpiece is a winner. Its biggest drawback is that you can't hear other Mac sounds when it's plugged in. Jul 94 ◯

★★★★ FlightStick Pro for Macintosh, CH

Products, 619/598-2518, $129.95. The authentic look and feel of this joystick, along with well-conceived software, make it a nearly perfect desktop pilot's companion. Dec 94

★★★★ Mac Keyboard Deluxe, MicroSpeed, 510/490-1403, $125. If you're in the market for a new or replacement keyboard, this one, which is both smaller and lighter than Apple's Extended Keyboard, is worth considering. It has four ADB ports. Nov 94

★★★ Mouse Deluxe Mac, MicroSpeed, 510/490-1403, $69. The extra buttons of this mouse offer several features that Apple's mouse doesn't match, but its shape may not suit everyone's taste. Mar 95

★★★ Wacom UD-1212R, Wacom Technology Corp., 206/750-8882, $749. Graphics tablet with pressure-sensitive stylus is easy to use and highly customizable, though it's incompatible with AppleTalk and AppleTalk Remote. May 94

MISCELLANEOUS HARDWARE

★★★★ AirNote 1.0, Notable Technologies, 510/208-4400, $349. Remote-messaging service lets you originate alphanumeric paging messages from your computer. It's a handy way to get into paging. Dec 94

★★★ Apple PCMCIA Expansion Module, Apple Computer, 408/996-1010, $219. Well-integrated, well-designed unit offers 500-series users an efficient and easy albeit expensive way to add features to their PowerBooks. If you can overlook the early-adopter prices (a big if), the PC Cards are great expansion options—lightweight, low-power, and high-performance. Mar 95

★★ G-Vox, Lyrrus, 215/922-0880, $399. Hardware-software guitar-instruction package lets your Mac "hear" the notes you play on your guitar. Although the hardware works well, the software has some basic problems and doesn't live up to the hardware. Apr 94

★★★★ IX-4015 Color Image Scanner, Canon Computer Systems, 714/438-3000, $1169. The price of this color flatbed scanner is competitive, and its speed and excellent bundled software make it easy to use and a good choice for the small office. Jul 94

★★ Macintosh TV, Apple Computer, 408/996-1010, $2079. As a computer, this combination computer-television-CD player is sleek but slow. You can get faster performance and better expandability from several less-expensive Performa models. Apr 94

★★★★ MultiSpin 4Xe, NEC Technologies, 708/860-9500, $515. With its competitive price, free tech support, and two-year warranty, this quad-speed CD-ROM player is ready to race. Feb 95

★★★★ Photo Engine, Radius, 408/541-6100, $1099. Photoshop-acceleration hardware's suite of four 66MHz 32-bit DSP chips offers sufficient processing power to speed up 25 Photoshop functions on the most sophisticated systems, including Power Macs. Feb 95 ◗

★★★★ SCSI Sentry, APS Technologies, 816/483-6100, $99. Although the price of this terminator may seem steep, this device may well be the cure for SCSI woes. Our reviewer heartily recommends it. Sep 94

★★★★ TurboDialer, Micromachines, 818/901-1700, $69.95. Automatic telephone dialer is a well-executed product, except for occasional computer noise that seeps into phone conversations. Jul 94

★★★★ Vivace, Coda Music Technology, 612/937-9611, $2295. As an intelligent and endlessly patient accompanist, this music study system for wind instruments may be the best thing that's happened to learning wind literature since the metronome. Jan 95

★★★★ Yamaha YST-M10 Powered Monitor Speakers, Yamaha, 714/522-9240, $149.95. Powered speakers have a good balanced sound and a great volume range at an outstanding price. Apr 94

MODEMS/NETWORK HARDWARE

★★ Cooperative Adapter, Photonics Corp., 408/955-7930, $349. The high cost of each unit, the limitations and restrictions inherent in diffuse infrared, and the low cost of traditional LocalTalk make this infrared network interface an expensive niche product. Dec 94

★★★★ Cypress PhonePro 1.2 (1.5), Cypress Research Corp., 408/752-2700, $349 to $950. By improving its integration with FaxPro and with PowerTalk and PowerShare, this powerful telephony software has greatly extended its business scope. May 94

★★★ DaynaPort Pocket SCSI/Link, Dayna Communications, 801/269-7200, $299 to $369. Inexpensive, lightweight SCSI-to-Ethernet connector works with both desktop Macs and PowerBooks and can use the Mac's ADB port as a power source. Nov 94

★★★★★ EtherWave, Farallon Computing, 510/814-5000, $129. Instead of providing only one 10BaseT twisted-pair jack, this Ethernet transceiver includes a second jack that lets you daisy-chain to another device through an additional 10BaseT line. May 94

★★★ FastSwitch 10, Grand Junction Networks, 510/252-0726, $6250. Switched Ethernet hub is a great solution for networks that handle large amounts of data traded peer-to-peer, but if your network consists of E-mail and a file server, you probably won't see much benefit in stepping up to switched Ethernet. Dec 94

★★★ OneWorld Fax, Global Village Communication, 415/390-8200, $999. Easy-to-use network fax product lets an office share fax-sending resources without dedicating a hard drive and CPU; however, it can't receive faxes and can't queue more than one fax document at a time from a single CPU. Aug 94

★★★ Pocket EtherTalk Adapter, Xircom, 818/878-7600, $349 to 399. All-in-one SCSI-to-Ethernet connector is lightweight and works with desktop Macs and PowerBooks. Nov 94

★★★★ PowerPort Mercury/PB 500 Series, Global Village Communication, 415/390-8200, $399. Top-notch fax modem is capable of exemplary fax and data communications performance. Nov 94

★★★ Spectra-Com P192mx, Bay Connection, 408/270-8070, $199.95. If you must have absolute portability and AC power isn't available, this pocket data/fax modem can do the job. It's not that much smaller than a regular desktop modem, however. Oct 94

★★★★ SupraFaxModem 288, Supra Corp., 503/967-2410, $329.95. This 28,800-bps fax modem is a very good performer, and the price isn't terribly steep. Combined with fast, stable fax software and a good terminal program, it's hard to beat. Aug 94

★★★ Watermark Message Central 2.0.2, High Tide Software, 510/704-9927, $499. If you're willing to put in a lot of effort, you'll find this highly sophisticated voice-mail system supremely flexible. It includes a specially modified modem with voice chip, as well as fax software and telecommunications software. Jul 94

PRINTERS

★★ Brother HJ-400, Brother International, 908/356-8880, $369. Compact, 360-dpi ink-jet printer is fairly slow and does not allow background printing. Some

large files require additional application memory to print correctly. May 94

★★★★ Color StyleWriter Pro, Apple Computer, 408/996-1010, $629. Color printer represents one of the best values in the inexpensive color-printing market. It's fast, produces nice-looking output, and has some good features, including a great way of handling color ink cartridges. Sep 94

★★★ HP LaserJet 4ML, Hewlett-Packard, 800/752-0900, $1279. Primarily for those of you who use a PC or work in a small, mixed-platform environment, this energy-efficient laser printer offers automatic port and language switching, and is a good buy. Its advanced PC features may not be worthwhile for those who use Macs only. May 94

★★★★ LaserWriter 16/600 PS, Apple Computer, 408/996-1010, $2399. If speed is what you need, this fine printer is it. The price is reasonable, but for the best printout quality look for a higher-dpi printer. Mar 95

★★★★★ LaserWriter Select 360, Apple Computer, 408/996-1010, $1599. Low-cost, high-performance, 10-ppm printer is perfect for small LocalTalk or mixed networks. For bigger networks, consider buying more than one; they're more cost-effective than a 20-ppm printer. Apr 94

★★ Notebook Printer II, Citizen America, 310/453-0614, $399. If weight and size are your biggest concerns in choosing a portable printer, and you print primarily in black-and-white, this thermal-fusion printer may be a good choice. If speed is at all an issue, however, other options may be preferable. Jun 94

★★★★ Personal LaserWriter 320, Apple Computer, 408/996-1010, $959. If you've been holding out for a high-quality personal laser printer that's fast enough to share over LocalTalk, the small inconveniences of this 300-dpi printer are easily outweighed by its low price, good speed, and PostScript Level 2 support. May 94

★★★★ PowerPrint 2.5, GDT Softworks, 604/291-9121, $149. Ingenious hardware-software combo lets you print from your Mac to almost any PC printer. It supports over 1000 printers, ranging from aging dot matrix models to the newer color ink-jet and laser printers. Sep 94

★★★ PrimeraPro, Fargo Electronics, 612/941-9470, $1895. The photo-realistic output of this thermal-wax and dye-sublimation printer beats that of any other printer in the price range. But with expensive consumables and slow print time, it's best suited for routine thermal-wax use and occasional dye-sub work. Jan 95

★★★ P-Touch PC, Brother International Corp., 908/356-8880, ext. 4307, $449.95. Versatile label printer is easy to set up and use, and produces high-quality output. The cost per label is high, though, and the documentation is weak. Sep 94

★★ QMS ColorScript Laser 1000, QMS, 205/633-4300, $7999. Color laser printer succeeds in combining the versatility of monochrome laser printing with attention-getting color, but if you don't need to chase rainbows right away, you might wait and see if competition drives capabilities up. Jul 94

★★★ Silentwriter 640, NEC Technologies, 508/264-8000, $825. With 3MB of RAM, PostScript Level 2 support, and a 6-ppm engine, this printer is a capable performer. Generally, it represents hassle-free printing, but it doesn't handle single sheets of paper well. Jun 94

★★★ Smart Label Printer Pro, Seiko Instruments, 408/922-5900, $299.95. If you need to print only a few labels at a time, this label printer may be an expensive but good choice. May 94
continues

Star Ratings

SYSTEMS/STORAGE

★★★★ **Alacrity PM 6100, KS Labs, 614/374-5665, $165.** Installing a clock booster is the quickest, easiest, and cheapest way to extract more power from Apple's entry-level Power Mac. **Oct 94** ◆

★★★★ **Brainstorm Accelerator for the Macintosh SE, Brainstorm Products, 415/988-2900, $199.** Your SE will never be a Power Mac or even a IIsi, but if your budget won't buy a new Mac, you can't do better than this accelerator, which pushes an SE's speed to close to a Classic II's in overall performance. **Mar 95**

★★★ **Conley SR2 RAID System, Conley Corp., 212/682-0162, $25,335.** While RAID technology is typically praised for its fault-tolerance rather than its speed, this high-performance storage system proves that you can have both. For critical tasks requiring redundancy and round-the-clock operation, this is one of the best Mac RAID systems shipping. **Sep 94**

★★★ **EtherDock, E-Machines, 408/541-6100, $699.** Heavy-duty Duo docking option is equipped with a full set of 11 ports, including an Ethernet port. The locking mechanism is alarmingly wobbly—although reliable enough to ensure a good connection. **May 94**

★★★ **Joule System, La Cie, 503/520-9000, price varies by component.** Plug-and-play tower lets you stack drives—including hard drives, removable media, and other modules—atop a base unit, making it easy to buy extra storage or swap modules with other Joule towers. Joule drive prices are generally slightly higher than for comparable drives, however. **Feb 95**

★★★★ **LC 575, Apple Computer, 408/996-1010, $1699.** For students and small-business professionals who want high power and the convenience of having everything integrated into one case, this 33MHz 68040 system is a good choice. **Jun 94**

★★★ **Newton MessagePad 110, Apple Computer, 408/996-1010, $599.** This is the personal digital assistant that Apple should have shipped in August 1993, with improved handwriting recognition, including deferred and letter-by-letter recognition. It also has more memory, longer battery life, and a more efficient design. **Aug 94**

★★★★ **OrangePC Model 200 Series, Orange Micro, 714/779-2772, $1139 to $3237.** If your goal is to get a Macintosh that runs Windows as fast as a PC, you can't get there from here. If your goal is to get business-level performance for day-in, day-out use, these PC coprocessor cards are probably your best choice. **Aug 94** ◆

★★★★ **PLI Infinity 270 Turbo, PLI, 510/657-2211, $651.** This 270MB SyQuest drive is fast, reliable, and a very good product. The cost of the medium is competitive with that of optical drives. **Sep 94**

★★ **PowerBook 150, Apple Computer, 408/996-1010, $1449.** Fast, lightweight portable is minimalist in the extreme, with no video-out, ADB, Ethernet, or microphone. Unfortunately, the price is less minimalist, and most budget-conscious shoppers would be better off buying a used or discontinued model. **Dec 94**

★★★ **PowerBook 540c, Apple Computer, 408/996-1010, $4839.** The prestige PowerBook du jour, this sleek, curvy and futuristic-looking notebook makes a good computer for both on-the-road and in-the-office use. Its nonstandard battery, memory, and Ethernet ports are not ideal features, however. **Oct 94**

★★★★ **PowerBook Duo 280c, Apple Computer, 408/996-1010, $3759.** If you travel a lot, this notebook computer is hands down the best Mac to get. It offers close to the power of a Quadra 650 in a subnotebook. **Oct 94**

★★ **PowerBook Duo Dock II, Apple Computer, 408/996-1010, $969.** Apple has added Ethernet to this full-featured docking station, but installing NuBus cards is still absurdly difficult. If you don't need NuBus expansion, consider other options. **Oct 94**

★★★★ **Power Macintosh 6100/60, Apple Computer, 408/996-1010, base model $1819.** Given its price and performance, this Power Macintosh is hard to resist. When developers offer in PowerPC format the software that most business users run daily, this should be a system that will give you power to spare. **Jun 94** ◆

★★★★★ **Power Macintosh 7100/66, Apple Computer, 408/996-1010, $2899.** Midrange Power Mac makes an outstanding workstation whose power should last for several years. The price is nothing to take lightly, but this system delivers every dollar's worth. **Aug 94** ◆

★★★★ **Power Macintosh 8100/80, Apple Computer, 408/996-1010, $4249.** While this system doesn't quite offer the excellent price/performance ratio of the other available Power Macs, you should consider it if you're a high-end user moving your work over to RISC-based computing. **Aug 94** ◆

★★★ **Power Macintosh 8100/110, Apple Computer, 408/996-1010, $6379.** High-end users who have invested heavily in NuBus cards can protect their investment with this top-of-the-line Power Mac. **Mar 95** ◆

★★★ **Power Macintosh Upgrade Card, Apple Computer, 408/996-1010, $699.** Current 33MHz 040 machines will get the best bang for the buck with this card, which is a less expensive upgrade path than a standard motherboard replacement. However, other Macs won't realize as much of a performance gain. **Oct 94** ◆

★★★★ **Quadra 630, Apple Computer, 408/996-1010, $1279.** Fast, inexpensive, expandable 33MHZ 68040 machine may be the last 680X0-based desktop Macintosh, but it's one of the best entry-level Macs ever. **Nov 94**

★★★ **SCSI MicroDock, Newer Technology, 316/685-4904, $175.** Tiny Duo docking station is just under 4 1/2 ounces and barely 5 inches long. It adds only an ADB port and a SCSI port—but both are useful. **May 94**

★★★★ **SledgeHammer2000FMF, FWB, 415/474-8055, $3179.** RAID drive is both fast and inexpensive. Although it can be a bit noisy when accessing data, it's a good deal. **Apr 94**

VIDEO/DISPLAY

★★★ **Apple Macintosh Display Card 24AC, Apple Computer, 408/996-1010, $1579.** 24-bit accelerated graphics card offers a satisfactory price/performance ratio, although it can't switch resolutions from the keyboard. **Oct 94**

★★★★ **Apple Multiple Scan 15 Display, Apple Computer, 408/996-1010, $509.** The tridot tube of this 15-inch monitor provides a sharp and accurate image, but reflects some glare. The built-in stereo speakers reproduce sound nicely and are a benefit for CD-ROM users. **Feb 95**

★★★ **Apple QuickTake 100 for Macintosh, Apple Computer, 408/996-1010, $749.** If you're in the market for a medium-quality, digital color camera that costs less than $1000, this is the best deal around. But if you're not in a hurry, you may want to wait until some of the camera's more obvious problems, such as its fixed-focus lens and lack of a zoom option, are ironed out. **Jul 94** ◆

★★★★ **FlexCam, VideoLabs, 612/988-0055, $595.** Small, unobtrusive desktop video camera has a flexible gooseneck for positioning. **Dec 94**

★★★ **Intellicolor Display/20, Radius, 408/434-1010, $2399.** Although with its exceptional brightness and clarity this monitor would be a fine addition to any designer's desk, the included Intellicolor software, which lets you control the settings of your display, doesn't offer much added value. **Apr 94**

★★★ **L-TV Portable, Focus Enhancements, 617/938-8088, $299.** Sturdy, inexpensive, external TV-converter plugs into your Mac and converts video output to NTSC. It provided a crisp, clean image, but mild flickering and conspicuous shimmers were persistent. **Aug 94**

★★★ **L-TV Pro NuBus, Focus Enhancements, 617/938-8088, $399.99.** NuBus card converts your Mac's RGB video signal to NTSC so you can use your Mac with a TV or VCR. It supports a wide range of Macs, but the image has some flicker and distortion, despite flicker-filtering software. **Aug 94**

★★★★ **Multiscan 15sf, Sony Computer Peripheral Products, 408/432-1090, $569.95.** Trinitron monitor has a flat screen that displays sharp, bright, and accurate images. With good antiglare coating and adjustable image tilt, it's worth looking at. **Feb 95**

★★★★ **MultiSync 3V Monitor, NEC Technologies, 708/860-9500, $495.** With a bright display and great image quality, this monitor delivers a fine picture at a moderate price. **Feb 95**

★★★★ **Panelight ZX, Panelight Display Systems, 415/772-5800, $3995 to $4695.** LCD panel offers vivid images at a comparatively low price. It's a great choice for presenters. **Mar 95**

★★★ **The Presenter Plus Mac/PC, Consumer Technology Northwest, 503/643-1662, $429.** Small, external TV-converter supports output to television from most Macs with built-in video. It does a barely passable job of providing a stable image. **Aug 94**

★★★ **QA-350 LCD, Sharp Electronics Corp., 800/237-4277, $2495.** At less than half the cost of a typical active matrix LCD panel, this passive matrix projection panel offers an economical alternative for presenters who don't need multimedia capability. **Jul 94**

★★★★ **QuickCam, Connectix Corp., 415/571-5100, $149.95.** For as little as $99 (street price), this tiny, fun, easy-to-use, digital video camera lets users experiment with video input for making QuickTime movies or capturing still images. **Mar 95**

★★★★ **Radius LeMansGT, Radius, 408/434-1010, $2499.** Fast, 24-bit accelerated graphics card has automatic 30-bit CLUT calibration and can switch resolution on the fly via a pop-up menu. **Oct 94**

★★ **RasterOps Horizon 24, RasterOps, 408/562-4200, $1999.** This 13-inch 24-bit accelerated graphics card is slower than anticipated and overpriced. The ROM can, however, be upgraded via software. **Oct 94**

★★★ **Simply TV, E-Machines, 408/541-6100, $439.** Easy-to-install video card plugs snugly into a PDS slot, and allows you to use your Mac with a television for display. The image is impressively flicker-free, but the resolution is limited to 256 colors. **Aug 94**

★★★★ **SuperMac Spectrum Power•1152, SuperMac, 408/541-6100, $1399.** Fast, relatively inexpensive, 24-bit accelerated graphics card can switch resolutions from the keyboard and offers zoom and pan options. **Oct 94**

★★ **Tornado Graphics Card, Mirror Technologies, 612/832-5622, $699.** Inexpensive 24-bit accelerated graphics card has zoom and pan options but is relatively slow. **Oct 94** ▥

Streetwise Shopper

SPECIAL HARDWARE AND SOFTWARE BUYING OPPORTUNITIES

Selected and edited by Charles Barrett

The following listings include both time-sensitive promotions and open-ended offers being sponsored by Macintosh vendors and their resellers. Each listing indicates which products have been awarded a star rating in *Macworld's Reviews* (products rated ★★ or lower are not eligible for inclusion), have been selected as an Editors' Choice, or have won a World-Class award. In some cases, the editorial evaluation quoted is for an earlier product version. The ◑ symbol indicates that the product is Power Mac related. Except where otherwise indicated, prices given are suggested retail prices.

When placing an order, please mention that you saw the offer in *Macworld*. Should any problems arise, contact the *Streetwise Shopper* editor by fax (415/442-0766), phone (415/978-3241), or mail (*Macworld*, 501 Second St., San Francisco, CA 94107).

Vendors and resellers desiring to have products and services included in this section are encouraged to contact the *Streetwise Shopper* editor with particulars.

BUNDLES

Apple Newton MessagePad 120 + Equate 1.0 Holosoft is offering its $99 Newton spreadsheet application, which exchanges files with Microsoft Excel, for $59.95 to customers who purchase a $599 (1MB) or $699 (2MB) MessagePad 120 through a Holosoft dealer. Both MessagePads come bundled with Notion: The Newton List Manager; the 2MB configuration also includes Intuit's Pocket Quicken for Newton, plus a month of Apple's eWorld online service and Pen Tekk Software's PowerNews. Call 408/748-9648 for nearest Holosoft reseller. *Offer expires 4/15/95.*

artWorks 1.0 + Clip Art + TrueType Fonts Deneba Software is including 8000 vector-based clip-art images and 500 text, display, and novelty typefaces on CD-ROM with its $49.95 artWorks 24-bit paint and draw program (Jun 93 ★★★). Call 305/596-5644 for more information.

HammerDLT 20G + ◑ Retrospect 2.1 FWB is including a DLT-compatible version of Dantz's $249 backup and archiving program (Sept 93 ★★★★ for Retrospect 2.0) with its $5499 HammerDLT 20G digital linear tape drive, which has a sustained data-transfer rate of over 140MB per minute. Call 415/474-8055 for more information.

◑ Kai's Power Tools 2.1 + KPT Bryce 1.0 HSC Software is offering a $299 bundle consisting of its $199 collection of plug-in extensions (May 94 ★★★★★ for Kai's Power Tools 2.0a) for such applications as Adobe Photoshop and Fractal Design Painter, plus its $199, 3-D landscape–rendering program (Dec 94 ★★★★). Also, MicroFrontier's $149.95 Color It 2.3, a 32-bit paint and image-editing application (Apr 93 ★★★ for version 2.0.1), is being included with Kai's Power Tools. Available through select mail order. Call 805/566-6200 for more information. *Offer good through at least 6/30/95.*

LabSuite National Instruments is offering its $1995 LabView general-purpose programming tool and $695 HiQ object-based numerical-analysis and data-visualization software combined in one package for $2395. Call 800/433-3488 for more information.

Street Atlas USA 2.0 + Select Phone + Capitol Hill MacWarehouse is offering a bundle for $79.95 that consists of DeLorme Mapping's $169 street-level map database of the entire United States on a single CD-ROM (Oct 94 ★★★); Pro CD's $159.95 Select Phone utility, which contains 10,000 phone books on 5 CD-ROMs; and Mindscape's $19.95 interactive tour of Capitol Hill (BND 0485), to customers who have purchased any CD-ROM drive from the company during the past 90 days. Bundle is also available, without the purchase of a drive, for $199.95 (BFE 0015). Call 800/255-6227 to order. *Offer expires 4/30/95.*

COMPETITIVE UPGRADES

Adobe Dimensions 2.0 Adobe Systems is offering registered users of Adobe Illustrator 5.5 or Photoshop 3.0 this $199, 3-D effects software (Apr 95 ★★★★) for $99. Call 800/521-1976 to order. *Offer expires 3/31/95.*

FullWrite 2.0.2 Akimbo Systems is offering this $395 word processor (Apr 95 ★★★ for version 2.0.1) for $120 to registered users of other word processors. Call 800/375-6515 to order or for more information.

◑ Canvas 3.5 Deneba Software is offering this $339 draw program (Jan 94 ★★★ for the 680X0 version), which includes 10,000 clip-art images and 2000 fonts on CD-ROM, to registered users of any Macintosh graphics program, for $149.95. Call 800/733-6322 for more information.

◑ Data Desk 4.2 Data Description is offering this $595 data-analysis package (Oct 93 "The Statistical Difference" Editors' Choice for version 4.1) to Abacus Concepts' MacSpin users for $297. Data Desk combines traditional statistics functions with dynamic data display and manipulation. It includes a full range of statistical plots and procedures. Free demo disk available. Call 800/573-5121 for more information.

◑ FolderBolt Pro 1.0; NightWatch II Registered users of DiskLock 3.0, UltraSecure, Ultrashield, Fileguard, and Empower can purchase Kent Marsh's $129.95 FolderBolt integrated security software (Jun 92 ★★★★ for FolderBolt 1.02) for $55 or can buy it bundled with the company's $159.95 NightWatch II hard-disk–security software (Nov 92 ★★★ for version 2.0.1b) for $79.95. Call 800/325-3587 for more information.

◑ VivaPress Professional 1.5 Interpress Technologies is offering this $895 page-layout application to registered users of PageMaker or QuarkXPress for $295. The AgfaType CD-ROM, which offers instant purchasing access to Agfa and Adobe's PostScript type libraries, is also provided. A coupon valued at up to $429 is included, offering any volume from Agfa's type library, plus a purchase price of $35 for Agfa's

TypeChart utility for creating customized type-specimen books. VivaPress Pro incorporates graphics functions, imposition, memory-saving Alias technology, and filters for editing images from FreeHand and Illustrator. A run-time version is available for service bureaus serving VivaPress users. Call 212/245-2700 for more information. *Offer good through at least 3/31/95.*

SPECIAL DISCOUNTS/OFFERS/REBATES

Adobe ScreenReady Adobe Systems is offering this $199 graphics utility package, which consists of a QuickDraw-based driver and a PostScript application, for an introductory price of $99. ScreenReady simplifies and speeds the process of readying files from design and page-layout applications for use in multimedia authoring programs by automatically converting images into PICT format. Call 800/521-1976 for more information. *Offer expires 4/30/95.*

AppGen 1.0 Pinehill Software is offering a special introductory price of $9.95 ($59.95 with bar-code capability) for this $99 ($149 with bar coding) data-entry-application generator for Apple Newton MessagePads. Price includes manual and online support (AOL, CompuServe, AppleLink, and eWorld). Call 508/548-4470 (Pinehill on AOL and AppleLink; 70511,2355 on CompuServe). *Offer expires 3/31/95.*

HP ScanJet IIcx Hewlett-Packard is offering a $150 rebate to those who purchase its $1179 ScanJet IIcx 24-bit color flatbed scanner (Nov 93 "Low-Cost Color Scanners" Editors' Choice for the IIc) between 11/1/94 and 3/31/95 and send in a coupon available at their local dealer. Call 800/722-6538 for more information. *Offer expires 3/31/95.*

Informed Designer Shana Corporation is offering its $295 electronic-forms-design package, complete with electronic documentation and technical support, free of charge. Available on CD-ROM (includes interactive video tutorial), or floppy disks for a $15 S&H charge, by calling 800/386-7244. *Offer good through at least 5/31/95.*

InTouch 2.5 Prairie Group is offering an introductory price of $49.95 for this $69.95 personal information manager desk accessory (Feb 93 ★★★ for version 2.0.4), which it aequired from Advanced Software last June. Call 800/346-5392 for more information. *Offer expires 4/15/95.*

◑ StuffIt SpaceSaver 3.5 MacMall is offering this $79.95 system enhancement from Aladdin Systems for $19.99 to customers who purchase any other product from MacMall. SpaceSaver safely and automatically doubles disk space and allows for the use of files and applications without having to manually decompress them. Call 800/222-2808 to order. *Offer expires 4/30/95.*

SuperBridge 3.0 Sonic Systems is offering owners of Apple's free LaserWriter Bridge a $99 credit toward the purchase of this $249 utility, which links up to ten LocalTalk devices of any kind to a host network that uses extended protocols. Call 800/535-0725 for more information. **m**

Macworld

Advertiser Index

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Get What You See, Finally!

RELISYS

AVEC 2400
Color Scanner

The Avec Color 2400 is a scanner which maximizes the desktop personal computer into a working imaging tool. It is a three pass design, capable of scanning an 8 1/2"x 14" area in 24-bit, 16.8 million colors with a maximum resolution of 2400 dpi. This translates into 180,000 pixels per square inch, a true benefit for image scanning. Bundled with Adobe™ Photoshop LE, OmniPage Direct OCR software and Art Scan Professional. The Avec 2400 has everything you need in an entry level color scanner with three times the specifications of the competition at a lower cost. SCSI-2 interface.

$489⁹⁹ #65711

RELI 2412 Mac/TE
Color Scanner with Transparency Adapter

The Reli 2412 Mac/TE is an excellent choice for the desktop publisher. It is of a single pass design, capable of scanning a 24-bit 8 1/2"x 14", 16.8 million color image with a maximum resolution of 2400 dpi. The 2412 Mac/TE maximum resolution translates into 360,000 pixels per square inch, which benefits anyone scanning color images and transparencies. Bundled with Adobe™ Photoshop LE, OmniPage Direct OCR software, Kai's PowerTools SE, Kai's PowerTools Tips and Tricks and ArtScan Professional. Transparency adapter not shown.

$789⁹⁹ #66771

RELI 4816 Mac/TE
Color Scanner with Transparency Adapter

The Reli 4816 Mac/TE is an excellent choice for desktop publishers and graphic artists. It is a single pass design capable of scanning a 24-bit 8 1/2"x14" color image with a maximum resolution of 4800 dpi. The Reli 4816 Mac/TE maximum resolution translates into 1,440,000 pixels per square inch. Bundled with Adobe™ Photoshop LE, OmniPage Direct OCR software, Kai's PowerTools SE, Kai's PowerTools Tips and Tricks and ArtScan Professional. Transparency adapter not pictured.

$979⁹⁹ #66772

RELI 4830 Mac/TE
Color Scanner with Transparency Adapter

The Reli 4830 Mac/TE is an excellent choice for desktop publishers and graphic artists requiring 30-bit color. It is of a single pass design, capable of scanning a 11 1/2"x14" image with a maximum of 16.8 millions colors at a resolution of up to 4800dpi. The Reli 4830 Mac/TE maximum resolution translates into 640,000 pixels per square inch. Exclusive to Reli 4830 is its transparency adapter with an LCD light source built in to the scanner's cover, which provides even more flexibility for the graphics professional. Bundled with Adobe™ Photoshop 3.0, OmniPage Direct OCR, Kai's PowerTools and Kai's PowerTools Tips & Tricks and ArtScan Professional. Transparency option not shown.

$1649⁹⁹ #67716

RELI 9624 Mac/TE
Professional Color Scanner with Transparency Adapter

The Reli 9624 Mac/TE is a scanning tool ideal for PrePress use and the graphics professional. It is of a single pass design, capable of scanning a 24-bit, 16.8 million color image with a maximum of 9600dpi. The 9624 Mac/TE's maximum resolution translates into 1,400,000 pixels per square inch. Includes transparency adapter for up to 8"x10" transparencies. Bundled with Adobe™ Photoshop 3.0 image processing, Omnipage Direct OCR software, Kai's PowerTools Tips & Tricks and ArtScan Professional. Transparency option not pictured. Document feeder pictured is optional.

$1949⁹⁹ #65710

RELI 9612 Mac/TE
Professional Color Scanner with Transparency Adapter

The Reli 9612 Mac/TE offers offers the extra power ideal for PrePress use and the graphics professional. It is of a single pass design, capable of scanning a 24-bit, 8 1/2"x11 1/2", 16.8 million color image with optical resolution of 1200x600. Includes a transparency adapter for up to 8"x10" transparencies. Bundled with Adobe™ Photoshop 3.0, OmniPage Direct OCR software, Kai's PowerTools, Kai's PowerTools Tips and Tricks and ArtScan Professional.

$1469⁹⁹ #66773

Powercard™ 601

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66MHz

$639⁹⁹ #67669

Turbo™ 601

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$1198⁹⁹ #67670

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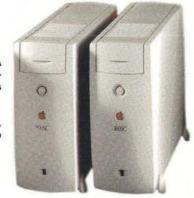
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270MB External	**$354⁹⁹** #67292	540MB External **$434⁹⁹**	#65385
340MB External	**$374⁹⁹** #66395	1080MB External **$824⁹⁹**	#66028

National Lampoon's Blind Date CD

TRIMARK INTERACTIVE

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Requirements: Double-Spin CD-ROM Drive, 8MB RAM, 4MB Hard Drive, 256 colors and System 7.

#68453 **$48⁹⁹**

Thumbelina CD

Thumbelina is the delightful children's fairy tale by Hans Christian Andersen. In this interactive storybook that introduces children to the wonders of computers, kids can point and click on several "Hot Spots" on each page. With over 17 unique characters each with their own distinctive voice and an original musical score with 4 complete songs, Thumbelina will provide hours of pleasure for children.

• 12 screens, 256 colors, portrait quality art with hundreds of interactive animations and sound effects
• Complete spoken narration with animated read-along text on the screen with every word, clickable for readover
• Contains no confusing menus or set up screens. Children can literally play with "Thumbelina" by themselves

#68454 **$29⁹⁹**

The Emperor's New Clothes CD

NEW PRODUCT
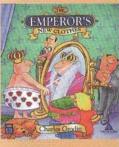
The Emperor's New Clothes is a delightful interactive storybook based on the fairy tale by Hans Christian Andersen. This fully animated interface will delight children for hours as they explore the story by clicking on "hot spots" which unveil hidden surprises. The Emperor's New Clothes is narrated by popular actor, Charles Grodin, star of the motion picture "Beethoven" and "Beethoven's Second".

• 13 screens, 256 colors, portrait quality art with hundreds of interactive animations and sound effects
• Complete spoken narration with animated read-along text on screen

#68857 **$31⁹⁹**

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APS SQ 3270	270MB	479⁹⁵

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†† Does not format 44MB & 88MB cartridges
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SyQuest Media	1-4	5-9	10+
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SQ-327 (270MB) cartridge	64⁹⁵	63⁹⁵	61⁹⁵

Prices listed are for unformatted media.
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External configuration

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**Actual data compression and tape capacity vary greatly depending on the type of data recorded, other system parameters and environment.*

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APS 1.3Gig MO¹	1899⁹⁵	1999⁹⁵

All MO Drives Include 1 FREE Cartridge

MO Media (unformatted)	1-4	5-9	10+
128MB cartridge —	$35⁹⁵	$34⁹⁵	$29⁹⁵
230MB cartridge —	45⁹⁵	44⁹⁵	39⁹⁵
1.3Gig cartridge —	109⁹⁵	109⁹⁵	104⁹⁵ (1024KB/s)

POWERBOOK DRIVES

Model	Capacity	Internal	LW Pro 630	Companion II
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APS Q 341¹	320MB	349⁹⁵	399⁹⁵	–
APS Q 514¹	490MB	449⁹⁵	499⁹⁵	–
APS T 520¹	500MB	449⁹⁵	499⁹⁵	599⁹⁵

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**Actual data compression and tape capacity vary greatly depending on the type of data recorded, other system parameters and environment.*

APS DAT DRIVES

Model	Capacity*	Internal	SR 2000
APS DAT²	4G on 90m	$749⁹⁵	$799⁹⁵
APS HyperDAT¹	8G on 120m	949⁹⁵	999⁹⁵

**Actual data compression and tape capacity vary greatly depending on the type of data recorded, other system parameters and environment.*

DAT Media	1-4	5-19	20+
60-Meter	$9⁹⁵	$8⁹⁵	$7⁹⁵
90-Meter	11⁹⁵	10⁹⁵	9⁹⁵
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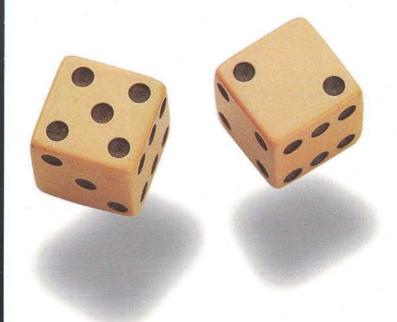
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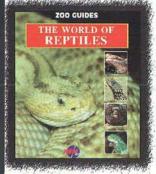
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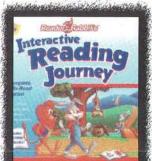
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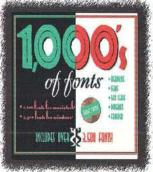
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I think you should be a librarian.

The job will not pay well (in fact, it will cost you a couple of billion), but after Microsoft and your business conquests are as long forgotten as John Sculley's technical expertise, your librarian role will be remembered. Actually, *remembered* is too modest a word—you will be cherished as one of the great men of all time, right up there with Michelangelo, Leonardo da Vinci, and Barry Diller. You will cross the chasm from rich, successful businessman to "goodness."

This is my idea. You should create a foundation for the preservation of books, manuscripts, and journals. (I would not relegate you to just any librarian position.) The reason is that books and manuscripts are falling apart, rotting, and turning to dust in libraries and museums all over the world. Every day society is losing its past as institutions are forced to save only what's crumbling fastest or what's most valuable.

When these books and manuscripts are gone, there will be no replacing them; and even the ones being preserved in their analog form are not available to most people. For example, if you want to read the original copy of *Adagia*, a collection of proverbs by Desiderius Erasmus published in 1508, it's not likely to be in the Seattle public library.

Think of what creating this foundation means: you would be known for eternity as the keeper of the knowledge of the human race. This is a lot better than the wealthiest man in America according to

Forbes for the next few decades. No one knows who Theodosius was (the emperor who ordered the burning of the library of Alexandria, according to your product Microsoft Bookshelf 1994), but people will know you. You've already made a start with your purchase of the electronic rights to artwork and da Vinci's manuscript, so why not go for it all?

I got this idea from an editor at Macmillan Publishing a few months ago. Then someone on the Internet, a marketing professor at the University of Missouri (who uses a Windows machine, no less), turned me on to the writing of Stephen Jay Gould. Gould is the eminent professor of biology, geology, and the history of science at Harvard University and a columnist for *Natural History* magazine.

Gould's writing reinforced for me the desirability of the idea.

His work is an elaborate tapestry of facts from the insights of an amazing number of people, ranging from Charles Darwin to Ty Cobb. He cites sources that mere mortals have never heard of, much less have access to. Try reading Gould's *Bully for Brontosaurus* (W. W. Norton & Company, 1991) if you don't believe me. It helps, however, that he is a famous professor at Harvard, so he can get to the crumbling books, manuscripts, and periodicals that the rest of us can't.

Gould himself expresses why this idea is so important as he discusses the pain that the loss of the library of Alexandria has caused:

"In part, we lament the loss of the utterly unknown. But we miss just as much the opportunity to relish a greatly expanded diversity among people and ideas that we already know and love. We miss the joy of making concrete, the pleasure of holding what has disappeared forever. What is history all about if not the exquisite delight of knowing the details, and not only the abstract patterns."

How much would it cost to preserve all of our printed treasure? I think $1 billion—$2 billion at the outside. Your net worth is at critical mass, so being worth $8 billion is the same as being worth $10 billion. You'll make Walter Annenberg look like the cheapskate who tosses a nickel into the Salvation Army kettle.
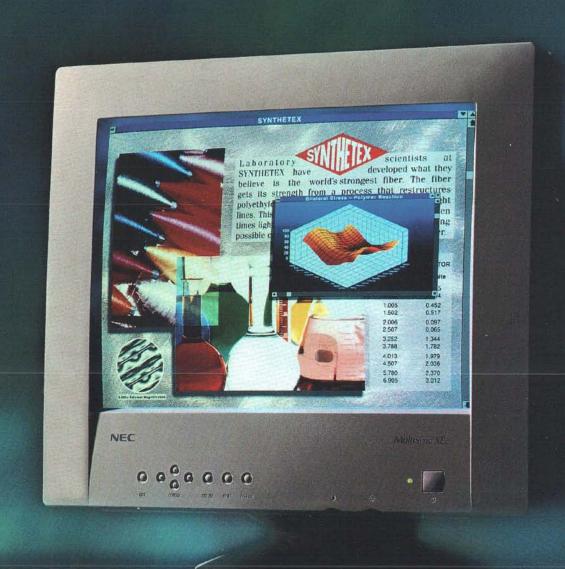
You may feel like you need to get something out of this foundation beyond knowing that you're preserving the history of man. OK. Many of these libraries and museums would grant you the electronic publishing rights for these priceless works. For them, this kills two birds with one stone: preserving the books, while increasing accessibility to knowledge for the common person. Then, post the electronic files on the Microsoft Network—you'll instantly create a compelling reason to use your service.

One more point: Please don't use the Word 6 format for these files. The information should be preserved for eternity, not take an eternity to see.

Sincerely,

Guy Kawasaki

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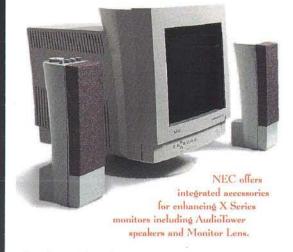
Three years ago, we set out on a mission. To build the finest computer monitors in the world. Which is a rather ambitious quest. After all, many experts already considered the NEC MultiSync monitor, first developed just a decade ago, the most precise, most brilliant monitor ever.

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technological achievement, our mission was rather un-technical: To build a line of computer monitors that were so realistic, so crystal-clear, so easy to control, that people would actually look forward to working with them.

NEC is proud to introduce the newest members of the MultiSync family: The XE Series.

To make everything perfectly clear, the XE Series features our unique OptiClear™ surface that virtually eliminates glare, an Invar shadow mask that assures maximum brightness without loss of focus, and a super fine .28 mm dot pitch. They also feature flicker-free refresh rates of up to 120Hz.

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Anatomy of a Smarter Mouse.

SMARTER CLICKING
Double-click with just one click.

SMARTER BUTTONS
Program any mouse button to perform the following repetitive tasks:

- *LOCK BUTTON. Just click once and you can drag, scroll, or highlight large blocks of text without having to hold the button down.*
- *SEND KEYS. Save time by executing multi-step commands with a single click. You can print a document, enter a block of text, log onto a network, download your e-mail, even send a fax from your fax/modem.*
- *SHORTCUTS. Work faster by automating frequently used Macintosh commands. You can open and close a file, copy, paste, eject a diskette, and a lot more. Just click once to execute any command.*

SMARTER CURSOR
Brilliant Cursor® technology saves time and jumps cursor to defined screen HotSpots. Save even more time and have cursor automatically jump to default button.

SMARTER SIDES
Rubberized EasyGrip™ sides for more comfort and control.

SMARTER MENUS
A single button click brings up a personalized pop-up menu. Use it to organize and execute commands within your favorite programs. Create a different menu for each program.

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Thinking Mouse Control – Active Set: Microsoft Word

Acceleration:	Custom	Cursor Keys:	
Other Acceleration:	Custom	Slow Cursor:	Ctrl+Shift
Double-Click Speed:		Brilliant Cursor:	Shift+Option
		Axis-Only:	Ctrl

Enhanced Mouse Buttons:

Button Press:	Response:	Modify... Add... Dele
Right Button	Double-Click Button	
Chord	Lock Button	
Left Button	Button	
Top Left Button	Save, Print, Close File	
Top Right Button	Paste My Signature	
Option+Right Button	Pop-Up Menu	

Bold Text
Indent
Change Font: Times
Save and Print
Style: Letterhead
My Signature

Thinking Mouse
4-Button Programmable Mouse

It has four programmable buttons. More than a dozen time-saving functions. You can even create a personalized pop-up menu for each of your favorite programs. And the hardware is as smart as the software—with rubberized EasyGrip™ sides for more comfort and control. From the makers of Turbo Mouse,® winner of more awards than any Macintosh input device in history. Compatible with System 6.0.7 or later and Power Macintosh. For more information, call Kensington at 800-535-4242. Outside the US and Canada, 415-572-2700. For information by fax, call and request document 323.

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